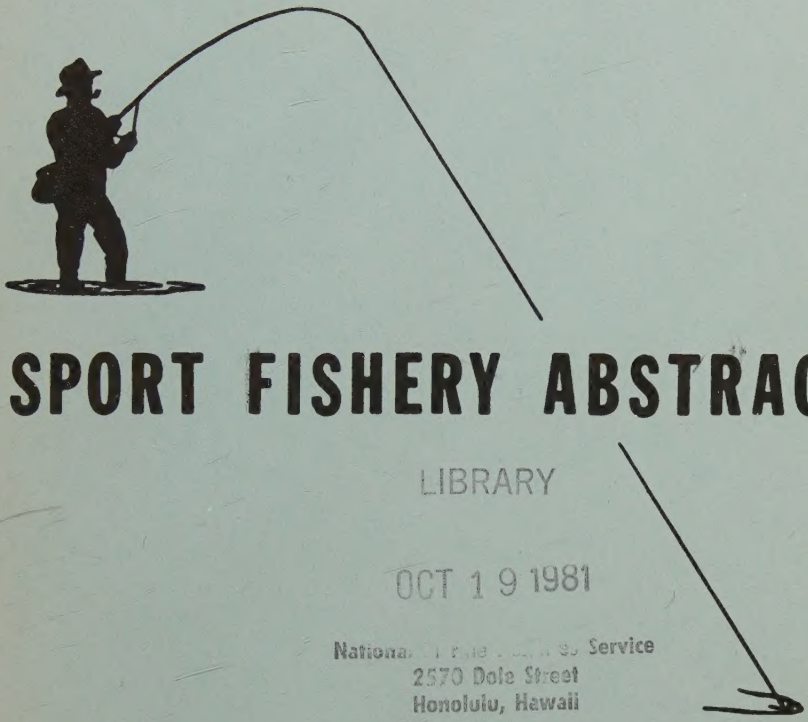
26(3)

26(3)



SPORT FISHERY ABSTRACTS

LIBRARY

OCT 1 9 1981

National ... Service
2570 Dole Street
Honolulu, Hawaii

Vol. 26, No. 3, 1981

DEPARTMENT OF THE INTERIOR
U. S. FISH AND WILDLIFE SERVICE

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

SPORT FISHERY ABSTRACTS

Roger Schoumacher, Editor
Terry N. Sexson, Assistant Editor

Editorial Office
U.S. Fish and Wildlife Service
Aylesworth Hall, CSU
Fort Collins, Colorado 80523

Sport Fishery Abstracts is intended to furnish fishery biologists with abstracts of current literature in sport fishery research and management.

One volume, consisting of four numbers, is issued each year. Each number contains separate Author, Geographic, and Taxonomic indexes, and the final number of each volume contains cumulative Author, Geographic, Taxonomic, and Subject indexes, and a list of publications screened. Authors who publish in journals not screened for *Sport Fishery Abstracts*, and who would like their publications included, should submit abstracts to the Editor.

The U.S. Fish and Wildlife Service assumes no responsibility for the accuracy of material from outside sources, and can only supply copies of articles written and published by the U.S. Fish and Wildlife Service.

SPORT FISHERY ABSTRACTS

An abstracting service for fishery research and management

Volume 26 Number 3 1981

CONTENTS

AQUATIC PLANTS AND THEIR CONTROL 1

CULTURE AND PROPAGATION

- General Fish Culture 1
- Trout and Salmon Culture 1
- Warmwater Culture 3
- Mariculture 4
- Feeds, Feeding and Nutrition 5
- Miscellaneous Culture Techniques and Equipment 11

ENVIRONMENTAL ISSUES, GENERAL AND MISC..... 12

LIMNOLOGY AND OCEANOGRAPHY

- General 12
- Chemical 12
- Benthos 13
- Plankton..... 13
- Primary Production 13

MORPHOLOGY, PHYSIOLOGY, GENETICS AND BEHAVIOR

- Morphology 14
- Physiology 19
- Genetics, Variation Studies, Hybridization 38
- Behavior 42

NATURAL HISTORY

- Life Histories - General Works 47
- Population Studies - Production, Standing Crop, Recruitment. 53
- Spawning Habits and Movements, Sex Ratios, Fecundity, etc... 56
- Movements, Seasonal and Depth Distribution, etc..... 62
- Foods and Feeding 65
- Age and Growth 72
- Geographical Distribution, Fish surveys, etc..... 74
- Abundance, Factors of Survival and Mortality 78
- Identification, Keys, Classification 80

PARASITES AND DISEASES

- General 83
- Bacterial 84
- Fungal 85
- Protozoan 86
- Viral 87
- Other 89

POLLUTION AND TOXICOLOGY

Pollution 92
Fish Kills 94
Toxicology; Bioassays 94

RESEARCH AND MANAGEMENT

General 100
Administration and Planning 101
Reports of Fishery Stations, States, etc..... 101
Habitat Alteration 102
Harvest, Creel Census, etc..... 102
Regulations 103
Marking and Tagging 104
Stocking and Introductions 104
Fishing Gear and Techniques 105
Fertilization of Water and Soil 106
Fishways, Fish Passage through Dams, etc..... 106
Mathematics, Statistical Methods and Modeling..... 107
Lake Management and Research 109
River and Stream Management and Research 110
Large Impoundment Management and Research 111
Estuary Management and Research 111
Marine Management and Research 112
Miscellaneous Techniques and Equipment 112

AUTHOR INDEX (Salmon) 113
GEOGRAPHIC INDEX (Yellow) 135
SYSTEMATIC INDEX (Blue) 139

AQUATIC PLANTS AND THEIR CONTROL

81-001713 Leventer, H. BIOLOGICAL CONTROL OF RESERVOIRS BY FISH. *Bamidgeh* 33(1):3-23. Mar. 1981. SFA 26(3)
[Cent. Lab. Water Qual., P.O. Box 610, Nazareth Elit, Israel]

81-001714 Mitchell, C. P. CONTROL OF WATER WEEDS BY GRASS CARP IN TWO SMALL LAKES. *N.Z. J. Mar. Freshwater Res.* 14(4):381-390. 1980. SFA 26(3)
[Fish. Res. Lab., P.O. Box 951, Rotorua, New Zealand] Chinese grass carp (*Ctenopharyngodon idella* Val.), 4-6 years old and weighing more than 2 kg, were incrementally stocked over a 3 year period at rates between 14 and 218 kg/ha in two small lakes. Preferential consumption of plants was recorded at low stocking densities; the aquatic species *Potamogeton ochreatus* and the emergent species *Eleocharis sphacelata* were the most palatable plants in the two lakes. Virtual elimination of *Potamogeton ochreatus*, *Eleocharis sphacelata*, *Egeria densa*, and *Nitella hookeri* occurred at higher stocking densities of grass carp. The relatively low stocking densities required for results in these trials compared with those used in earlier trials in flowing water suggest that grass carp may exert some indirect form of weed control. The difficulties inherent in attaining 'optimum' levels of aquatic plant control using grass carp are discussed.

GENERAL FISH CULTURE

81-001715 Hochman, L. and A. Kirka. THE USE OF RESULTS OF ICHTHYOLOGICAL RESEARCH IN THE INTENSIFICATION OF FISH PRODUCTION. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 35-38. 1981. SFA 26(3)
[Lab. Fish. Res. Hydrobiol., Bratslava, Czechoslovakia]

TROUT AND SALMON CULTURE

81-001716 Abbad, F. N. THE INFLUENCE OF THE QUALITY OF SPAWNERS AND OF CONDITIONS OF REARING ON THE VARIABILITY OF UNDERYEARLINGS OF THE STEELHEAD TROUT, *SALMO GAIRDNERI*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(2):144-148. 1980. SFA 26(3)
[VNIRO, Moscow, USSR]

81-001717 Billard, R. SHORT-TERM PRESERVATION OF SPERM UNDER OXYGEN ATMOSPHERE IN RAINBOW TROUT (*SALMO GAIRDNERI*). *Aquaculture* 23(1-4):287-293. Apr. 1981. SFA 26(3)
[Lab. Physiol. Poissons, INRA, F 78350 Jouy-en-Josas, France] Experiments were carried out to test the possibilities of using plastic bags inflated with oxygen to preserve and to transport rainbow trout sperm. Sperm survival

TROUT AND SALMON CULTURE (CONTINUED)

81-001717 CONTINUED is improved after storage in an O_2 atmosphere in comparison with storage in air. After storage of 5 days (Exp. 1) fertilizing ability was similar under O_2 to that of the controls (freshly collected sperm) but under air it was significantly low ($P < 0.001$). In another experiment (Exp. 2), fertilizing capacity depended on the rate of dilution and the quality of the eggs. With some females high levels of fertilization were recorded after 14 days of sperm storage and with other females fertilizing capacity of the same sperm drops within one day. The variability of the response still limits the practical application of short-term preservation of rainbow trout sperm.

81-001718 Bry, C. TEMPORAL ASPECTS OF MACROSCOPIC CHANGES IN RAINBOW TROUT (*SALMO GAIRDNERI*) OOCYTES BEFORE OVULATION AND OF OVA FERTILITY DURING THE POST-OVULATION PERIOD; EFFECT OF TREATMENT WITH 17α-HYDROXY-20β-DIHYDROPROGESTERONE. *Aquaculture* 24(1-2):153-160. May 1981. SFA 26(3)
[Lab. Physiol. Poissons, I.N.R.A., 78350 Jouy-en-Josas, France]

81-001719 Hochman, L. THE SIGNIFICANCE OF COREGONIDS IN POLYCULTURAL FISH POND POPULATIONS IN CZECHOSLOVAKIA. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 31-33. 1981. SFA 26(3)
[Lab. Fish. Res. Hydrobiol., Bratslava, Czechoslovakia]

81-001720 Mighell, J. L. CULTURE OF ATLANTIC SALMON, *SALMO SALAR*, IN PUGET SOUND. *Mar. Fish. Rev.* 43(2):1-8. Feb. 1981. SFA 26(3)
[NMFS, Seattle, WA 98112] Atlantic salmon, *Salmo salar*, stocks are extremely low in New England streams. A pilot study conducted in Puget Sound, Wash., showed that Atlantic salmon brood stock could be reared successfully by combining special techniques of fry rearing and saltwater pen culture as used for Pacific salmon. Fingerlings smolted at 13-15 months of age and first adult spawning occurred at 4 years of age. Smolt size varied in different groups from an average weight of 19.6-200 g (0.70-7.0 ounces). The 1971 and 1974 brood Atlantic salmon spawned for the first time at 4 years of age, when they were averaging about 4.0 kg (8.8 pounds) and 4.2 kg (9.4 pounds), respectively. Survival of the 1971 and 1974 broods in salt water from smolt to mature adult was 90.3 and 81.1 percent, respectively. The egg survival through hatching was 82.7 and 71.4 percent, respectively.

81-001721 Nosho, T., (ed.). SALMONID BROODSTOCK MATURATION. *Wash. Sea Grant Publ.* WSF-WO80-1. vi + 92p. May 1981. Available @ $3.00 from Wash. Sea Grant Communition, 3716 Brooklyn Ave. N.E., Seattle, WA 98105. SFA 26(3)
A collection of papers.--RS

81-001722 Sower, S. A. SEXUAL MATURATION OF COHO SALMON (*ONCORHYNCHUS* KISUTCH): INDUCED OVULATION, *IN VITRO* INDUCTIONS OF FINAL MATURATION AND OVULATION, AND SERUM HORMONE AND ION LEVELS OF SALMON IN SEAWATER AND FRESH WATER. *Ph.D. dissertation, Oreg. State Univ.* 97p. 1981. From Diss. Abstr. Int. B Sci. Eng. 41(11):3949. May 1981. SFA 26(3)

WARMWATER CULTURE

81-001723 Buckley, J. and B. Kynard. SPAWNING AND REARING OF SHORTNOSE STURGEON FROM THE CONNECTICUT RIVER. *Prog. Fish-Cult.* 43(2):74-76. Apr. 1981. SFA 26(3)
[Mass. Coop. Fish. Res. Unit, Univ. Mass., 204 Holdsworth Hall, Amherst 01003]

81-001724 Edwards, P.; O.-A. Sinchumpasak; V. K. Labhsetwar and M. Tabucanon. THE HARVEST OF MICROALGAE FROM THE EFFLUENT OF A SEWAGE FED HIGH RATE STABILIZATION POND BY *TILAPIA NILOTICA*. PART III: MAIZE CULTIVATION EXPERIMENT, BACTERIOLOGICAL STUDIES, AND ECONOMIC ASSESSMENT. *Aquaculture* 23(1-4):149-170. Apr. 1981. SFA 26(3)
[Div. Agric. Food Eng., Asian Inst. Technol., Bangkok, Thailand] There was a linear relationship between maize yield and total nitrogen applied irrespective of the source of the nutrient: organic (raw sewage, fish pond effluent) or inorganic (commercial fertilizer). An absolute relationship between maize yield and total nitrogen applied could not be developed due to differences in soil fertility (in the experiment apparently due largely to soil physical characteristics). The effluent from the fish ponds contravened the WHO standard of $< 10^2$ faecal coliforms/100 ml for wastewater reuse for crops eaten cooked and for fish culture. The land required to treat and recycle domestic sewage from a hypothetical city of 100 000 people (design criteria: 40 g BOD_5 and 70 l water consumption/person/day i.e., sewage strength 570 mg BOD/l) was estimated at 63 ha. The land area ratios were 1.86:1:10.25 for the high rate stabilization pond, fish pond, and maize plot, respectively. It is suggested that where land is available in the tropics, wastewater be recycled in a system of conventional stabilization ponds modified for fish cultivation as well as waste treatment. Particular emphasis must be given to public health, pollutants as well as pathogens, in recycled wastewater. Perhaps the only rational way to use a high rate stabilization pond is to harvest the phytoplankton directly from the effluent for use as animal feed.

81-001725 Eldani, A. and J. H. Primavera. EFFECT OF DIFFERENT STOCKING COMBINATIONS ON GROWTH, PRODUCTION AND SURVIVAL OF MILKFISH (*CHANOS CHANOS* FORSKAL) AND PRAWN (*PENAEUS MONODON* FABRICIUS) IN POLYCULTURE IN BRACKISHWATER PONDS. *Aquaculture* 23(1-4):59-72. Apr. 1981. SFA 26(3)
[Mindanao State Univ.-Sulu Coll. Technol. Oceanogr., Bongao, Tawitawi, Philippines]

81-001726 Hecht, T. REARING OF SHARPTOOTH CATFISH LARVAE (*CLARIAS GARIEPNUS* BURCHELL, 1822: CLARIIDAE) UNDER CONTROLLED CONDITIONS. *Aquaculture* 24(3-4):301-308. June 1981. SFA 26(3)
[Dep. Zool., Univ. North, P.B. X5090, Pietersburg, South Africa] *Clarias gariepinus* larvae were fed on different diets: trout starter, soya bean flour, Torula yeast, Vital yeast, Tetramin, hard boiled egg yolk and plankton. The aim was to determine that suitability of dry feed as a first nutrient of catfish larvae. For the first 10 days larvae fed on Torula yeast (*Candida utilis*) grew significantly faster (8.69±1.76%) than the larvae fed on other foods, whereafter those larvae fed on plankton exceeded the yeast fed larvae in growth. Mortalities of larvae fed on yeast and plankton were negligible. Larval behaviour during feeding and digestion rates of the various feeds are discussed.

81-001727 Liang, Y.; J. M. Melack and J. Wang. PRIMARY PRODUCTION AND FISH YIELDS IN CHINESE PONDS AND LAKES. *Trans. Am. Fish. Soc.* 110(3):346-350. May 1981. SFA 26(3)
[Mar. Sci. Inst., Univ. Calif., Santa Barbara 93106]

WARMWATER CULTURE (CONTINUED)

81-001728 Tuten, J. S. and J. W. Avault, Jr. GROWING RED SWAMP CRAYFISH (*PROCAMBARUS CLARKII*) AND SEVERAL NORTH AMERICAN FISH SPECIES TOGETHER. *Prog. Fish-Cult.* 43(2):97-99. Apr. 1981. SFA 26(3)
[Sch. For. Wildl. Manage., La. State Univ., Baton Rouge 70803]

81-001729 Willis, D. W. INTENSIVE CULTURE OF LARGEMOUTH BASS FRY. *Ph.D. dissertation, Colo. State Univ.* 62p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(11):3949. May 1981. SFA 26(3)

81-001730 Zur, O. PRIMARY PRODUCTION IN INTENSIVE FISH PONDS AND COMPLETE ORGANIC CARBON BALANCE IN THE PONDS. *Aquaculture* 23(1-4):197-210. Apr. 1981. SFA 26(3)
[Counselling Psychol., Lesley Coll., 7 Mellen St., Cambridge, MA 02138]

MARICULTURE

81-001731 Bower, C. E. and D. T. Turner. ACCELERATED NITRIFICATION IN NEW SEAWATER CULTURE SYSTEMS: EFFECTIVENESS OF COMMERCIAL ADDITIVES AND SEED MEDIA FROM ESTABLISHED SYSTEMS. *Aquaculture* 24(1-2):1-9. May 1981. SFA 26(3)
[Sea Res. Found., Inst. Aquarium Stud., P.O. Box 7-495, West Hartford, CT 06107] The conditioning period or time required to establish nitrification in new seawater culture systems was reduced substantially or eliminated after seeding with various media from established seawater aquariums. The relative effectiveness of the seed media was: 10% wet filtrant > 5% wet filtrant > 20% seawater > 10% dry filtrant. The introduction of commercial additives containing nitrifying bacteria or of filtrant from an established freshwater culture system did not accelerate the nitrification sequence in new seawater aquariums.

81-001732 Bower, C. E.; D. T. Turner and S. Spotte. pH MAINTENANCE IN CLOSED SEAWATER CULTURE SYSTEMS: LIMITATIONS OF CALCAREOUS FILTRANTS. *Aquaculture* 23(1-4):211-217. Apr. 1981. SFA 26(3)
[Sea Res. Found., Inst. Aquarium Stud., P.O. Box 7-495, West Hartford, CT 06107] Three calcareous filtrants (crushed oyster shell, limestone, and dolomitic limestone) failed to maintain pH values above 8.0 in closed seawater culture systems. The exposure of fresh filtrants to artificial seawater at pH 8.4 produced immediate decreases in pH, the magnitude of which varied with the chemical composition of the filtrant. All the calcareous filtrants, however, sustained pH values above 7.5 and prevented the rapid acidification of culture water that occurred with silica filtrant. The solution kinetics of carbonate minerals in seawater make calcareous filtrants valuable prophylactics against extreme decreases in pH, but buffering agents such as sodium bicarbonate or sodium carbonate must be added regularly to maintain pH values above 8.0.

81-001733 Hettler, W. F. SPAWNING AND REARING ATLANTIC MENHADEN. *Prog. Fish-Cult.* 43(2):80-84. Apr. 1981. SFA 26(3)
[NMFS, Beaufort Lab., Beaufort, NC 28516]

81-001734 Inoue, M.; H. Yatomi; M. Aoki; S. Ooga; T. Utida and A. Miyashita. [STUDIES ON DOMESTICATION AND EXTENSIVE BREEDING OF SKIPJACK TUNAS AND OTHER FISHES-III. BEHAVIOUR OF SOME "FOLLOWING," AND SHORT HOMING BEHAVIOUR OF THE SCOMBRIDAE AND THE CARANGIDAE DOMESTICATED IN FISH PRESERVE (ARTIFICAL FLOATING FISH REEF). *J. Fac. Mar. Sci. Technol. Tokai Univ.* No. 14. 343-355. 1981. In Japanese with English summ. SFA 26(3)
[Fac. Mar. Sci. Technol., Tokai Univ., Japan]

MARICULTURE (CONTINUED)

81-001735 Kaya, C. M.; A. E. Dizon and S. D. Hendrix. INDUCED SPAWNING OF A TUNA, *EUTHYNNUS AFFINIS*. *NOAA Fish. Bull.* 79(1):185-187. Jan. 1981. SFA 26(3)
[Dep. Biol., Mont. State Univ., Bozeman 59717]

81-001736 Lodi, E. and G. Badino. RIPRODUZIONE IN LABORATORIO DEL COBITE COMUNE, *COBITIS TAENIA BILINEATA* CANESTRINI (OSTEICHTHYES, COBITIDAE). [REPRODUCTION IN THE LABORATORY OF THE SPINED LOACH, *COBITIS TAENIA BILINEATA* CANESTRINI (OSTEICHTHYES, COBITIDAE).] *Riv. It. Piscic. Ittiop.* 16(1):1-12. Jan.-Mar. 1981. In Italian with English summ. SFA 26(3)
[Ist. Zool., Univ. Torino, Via Accademia Albertina, 17-10123 Torino, Italy]

FEEDS, FEEDING, AND NUTRITION

81-001737 Bondari, K. and D. C. Sheppard. SOLDIER FLY LARVAE AS FEED IN COMMERCIAL FISH PRODUCTION. *Aquaculture* 24(1-2):103-109. May 1981. SFA 26(3)
[Dep. Entomol. Fish., Coastal Plain Exp. Stn., Univ. Ga., Tufton 31793] Soldier fly larvae (*Hermetia illucens* L.), grown on chicken manure at a commercial caged layer house, were fed to channel catfish and tilapia, alone, and in combination with high-(45%) and low-(30%) protein commercial diets. The commercial diets also were fed alone as standards. Similar effects of the six diets on body weight and total length of the two species of fish for the 10-week test indicated that soldier fly larvae may be valuable feedstuff in commercial fish production. Results of the taste tests indicated that fish fed soldier fly larvae are acceptable to the consumer.

81-001738 Bromley, P. J. and G. Smart. THE EFFECTS OF THE MAJOR FOOD CATEGORIES ON GROWTH, COMPOSITION AND FOOD CONVERSION IN RAINBOW TROUT (*SALMO GAIRDNERI* RICHARDSON). *Aquaculture* 23(1-4):325-336. Apr. 1981. SFA 26(3)
[Minist. Agric. Fish. Food, Fish. Lab., Pakefield Rd., Lowestoft, Suffolk NR33 0HT, England] Trout foods can usually be classified into a number of broad categories, though it is uncertain if any particular category has biological advantages over the others. The main areas of concern are as to the relative merits of wet and dry diets and to the value of fresh and frozen foods in comparision with compound feeds based on processed meals. The present study shows that when effort was made to standardise the nutrient content of the diets by using the same or similar ingredients in their preparation, the food category to which the diet belonged was of little significance. Trout fed to satiation on a dry compound feed, a moist compound feed and a mixture of compound feed and industrial fish exhibited almost identical performance. There were no significant differences in terms of dry matter intake, growth, fish composition, change in condition factor, and food conversion efficiency. Poorer performance on two other categories of food, which included an industrial fish based diet and also a mixture of compound feed and fish silage, was more convincingly attributed to the use of inferior quality ingredients than to food category. Initially the trout appeared to lay down considerable quantities of energy reserves in the form of lipid and this led to an increase in condition factor. Food conversion efficiency was also high, of the order 1:1 on a dry weight of food to wet weight of fish basis. However, within three months food conversion had dropped by half to 2:1 and excess food was apparently no longer put into store in appreciable amounts.

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

81-001739 Bryant, P. L. and A. J. Matty. ADAPTATION OF CARP (*CYPRINUS CARPIO*) LARVAE TO ARTIFICIAL DIETS. I. OPTIMUM FEEDING RATE AND ADAPTATION AGE FOR A COMMERCIAL DIET. *Aquaculture* 23(1-4):275-286. Apr. 1981. SFA 26(3)

[Dep. Biol. Sci., Univ. Aston, Gosta Green, Birmingham, England] Over a period of 18 days after hatching, seven batches of carp larvae and post-larvae weighing between 2.5 and 35.0 mg were transferred directly from a diet of *Artemia* nauplii to a commercial trout fry diet and their growth and mortality followed. It was concluded that carp larvae and post-larvae with an initial body weight of 9.5 mg and above exhibit an improved ability to utilise and survive upon an artificial diet, compared with larvae of a lower initial body weight. On the basis of this finding, two age/weight classes of carp post-larvae and fry initially weighing approximately 15 and 100 mg respectively were offered graded quantities of a commercial trout fry diet in amounts ranging from 2.5-30% of their body weight per day, and growth followed for a period of 12 days. Optimal growth and food conversion occurred for feeding rates of between 15 and 17.5% of body weight per day for the first weight class of post-larvae, reducing to between 10 and 15% of body weight per day for the second weight class of fry. The potential significance of these results in relation to commercial production of carp larvae is discussed.

81-001740 Clady, M. D. COOL-WEATHER GROWTH OF CHANNEL CATFISH HELD IN PENS ALONE AND WITH OTHER SPECIES OF FISH. *Prog. Fish-Cult.* 43(2):92-95. Apr. 1981. SFA 26(3)

[Okla. Coop. Fish. Res. Unit, Okla. State Univ., Stillwater 74078]

81-001741 Dahlgren, B. T. IMPACT OF DIFFERENT DIETARY PROTEIN CONTENTS ON FECUNDITY AND FERTILITY IN THE FEMALE GUPPY, *POECILIA RETICULATA* (PETERS). *Biol. Reprod.* 24(4):734-746. May 1981. SFA 26(3)

[Dep. Anim. Ecol., Univ. Lund, S-223 62 Lund, Sweden] Individual fecundity and reproductive output (number of ova plus vitellogenic oocytes) were significantly higher in groups of guppies (*Poecilia reticulata*, Peters) given 72% protein compared with females fed on either 53%, 23%, or 15% protein. Ovum diameter and size of vitellogenic oocytes were significantly larger in females exposed to either 72% or 53% protein than in groups fed on 15% protein. Females living a 72% protein-rich diet showed a significantly higher total body weight, ovarian length, width, height, gonad volume and weight than groups fed on either 23% or 15% protein. Significantly higher values of these variables were also found among females given 53% protein compared with groups fed on 15% protein. Average gonadosomatic index increased with higher protein amounts. Growth was significantly higher in females ingesting 72% protein than in groups fed on either 42% or 23% protein.

81-001742 de la Higuera, M.; F. J. Sánchez-Muniz; F. J. Mataix and G. Varela. NITROGEN UTILIZATION BY RAINBOW TROUT (*SALMO GAIRDNERI*) FED ON THE YEAST *HANSENULA ANOMALA*. *Comp. Biochem. Physiol. A Comp. Physiol.* 69(3):583-586. 1981. SFA 26(3)

[Dep. Fisiol. Anim., Fac. Farm., Univ. Complutense, Madrid-3, Spain] Nutritive and metabolic consequences of feeding rainbow trout with a single cell protein diet were studied. Experimental diet was adjusted by using yeast *Hansenula anomala* as the only protein source, compared to white fish meal for the controls. Food intake, weight increments and consequently protein efficiency ratio (PER) significantly decreased in trout fed on yeast diet. Furthermore, body nitrogen increase was lower and protein productive value (PPV) higher for the same diet, although in a nonsignificant way. Plasma ammonia increased significantly in the experimental animals. Plasma urea levels, although increased in about 90%, were not significantly altered. Plasma uric acid levels, unaltered in plasma and liver, suffered a three-fold increase in kidney.

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

81-001743 De Silva, S. S. and D. E. M. Weerakoon. GROWTH, FOOD INTAKE AND EVACULATION RATES OF GRASS CARP, *CTENOPHARYNGODON IDELLA* FRY. *Aquaculture* 25(1):67-76. July 1981. SFA 26(3)

[Dep. Zool., Ruhuna Univ. Coll., Matara, Sri Lanka] Grass carp fry ranging in weight from 9 mg to 300 mg were used in experiments to determine their response to diets of coconut meal and a 1:3 mixture, by weight, of coconut meal and zooplankton at 28 and 33°C. The food intake was generally higher in those fry maintained on the mixed diet at 33°C. The rate of growth was always found to be higher in those fry maintained on a mixed diet at 28°C. The rate of weight increase of fry expressed as a percentage of the initial body weight tended to decrease in fry maintained on a diet of coconut meal, wilst the reverse was observed for others. A maximum food conversion ratio of 1.29 was recorded for fry maintained on a mixed diet of coconut meal and zooplankton at 28°C. Fry of grass carp changed from an almost exclusively carnivorous to a herbivorous one at a length of 25-30 mm. The evacuation time was both temperature- and weight-dependent, decreasing with increasing weight at a particular temperature.

81-001744 Dunham, R. A. and R. O. Smitherman. GROWTH IN RESPONSE TO WINTER FEEDING OF BLUE, CHANNEL, WHITE, AND HYBRID CATFISHES. *Prog. Fish-Cult.* 43(2):63-66. Apr. 1981. SFA 26(3)

[Dep. Fish. Allied Aquacult., Agric. Exp. Stn., Auburn, AL 36849]

81-001745 Edwards, P. and O.-A. Sinchumpasak. THE HARVEST OF MICROALGAE FROM THE EFFLUENT OF A SEWAGE FED HIGH RATE STABILIZATION POND BY *TILAPIA NILOTICA*. PART I: DESCRIPTION OF THE SYSTEM AND THE STUDY OF THE HIGH RATE POND. *Aquaculture* 23(1-4):83-105. Apr. 1981. SFA 26(3)

[Div. Agric. Food Eng., Asian Inst. Technol., Bangkok, Thailand]

81-001746 Edwards, P.; O.-A. Sinchumpasak and M. Tabucanon. THE HARVEST OF MICROALGAE FROM THE EFFLUENT OF A SEWAGE FED HIGH RATE STABILIZATION POND BY *TILAPIA NILOTICA*. PART II: STUDIES OF THE FISH PONDS. *Aquaculture* 23(1-4):107-147. Apr. 1981. SFA 26(3)

[Div. Agric. Food Eng., Asian Inst. Technol., Bangkok, Thailand] *Tilapia nilotica* grew well in the fish ponds fed with algal laden high rate stabilization pond effluent, but ceased to grow after 3 months in the 4 m^3 concrete ponds, irrespective of stocking density or mean pond algal concentration. Relatioships between fish growth and stocking density were established, which may be of use in further studies on waste recycling systems involving *Tilapia*. The mean weight of individual fish fell as the stocking density was increased but the final yield or weight of the fish population increased. A fish stocking density of 10/m^3 may be sufficient to produce a high fish yield, although composed of small individual fish, suitable for processing into high protein animal feed. Extrapolated yields approaching 10 tons/ha/year were obtained in the 4 m^3 concrete pond system based on 3 month growing periods, but evidence was presented which indicates that similar yields may be obtainable in larger, earth ponds with a single fish crop/year. A linear relationship was established between fish yields and mean phytoplankton concentration in the fish ponds. A concentration of 70 mg/l may be high enough to produce good fish growth, since higher concentrations would lead to zero pond dissolved oxygen concentrations in the early morning hours. Since phytoplankton, including blue green and euglenoid algae, were the dominant biota in the ponds and in fish guts, the fish obviously filtered the microalgae from the water and used them as food. Crude food conversion ratios based on phytoplankton added and retained in the fish ponds were 6.2 and 2.5 at maximum fish yields, respectively. Since the lower value is similar to that obtained with some high protein supplementary feeds, the high nutritional value of waste grown microalgae was demonstrated. The efficiency of fish production/unit

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

81-001746 CONTINUED phytoplankton biomass increased as the detention time and therefore the mean pond phytoplankton concentration was reduced; however, maximum efficiency would require larger areas of land to obtain significant fish yields, since fish growth was directly correlated with mean pond phytoplankton concentration. The key to increasing fish production in the tropics with minimal energy inputs may well be via waste grown microalgae.

81-001747 Grave, H. FLUORIDE CONTENT OF SALMONIDS FED ON ANTARCTIC KRILL. *Aquaculture* 24(1-2):191-196. May 1981. SFA 26(3)
[Inst. Meereskunde Univ. Kiel, Düsternbrooker Weg 20, 2300 Kiel, West Germany] In long-term experiments salmonids were fed for up to 3 years on Antarctic krill in bracksih water net cages in Kiel Fjord. The fish showed a considerable accumulation of fluoride in their skeletons (up to 670 mg/kg of dry matter). Fluoride content in the muscle tissue increased slightly with the duration of the experiment but did not exceed the concentrations found in several wild fish species from the North Sea by other authors.

81-001748 Henderson, R. J. and J. R. Sargent. LIPID BIOSYNTHESIS IN RAINBOW TROUT, *SALMO GAIRDNERII*, FED DIETS OF DIFFERING LIPID CONTENT. *Comp. Biochem. Physiol. C Comp. Pharmacol.* 69(1):31-37. 1981. SFA 26(3)
[N.E.R.C. Inst. Mar. Biochem., St. Fittick's Rd., Aberdeen AB1 3RA Scotland]

81-001749 Hogendoorn, H. CONTROLLED PROPAGATION OF THE AFRICAN CATFISH, *CLARIAS LAZERA* (C.& V.) IV. EFFECT OF FEEDING REGIME IN FINGERLING CULTURE. *Aquaculture* 24(1-2):123-131. May 1981. SFA 26(3)
[Agric. Univ., Dep. Fish Cult. Inland Fish., P.O. Box 338, Wageningen, The Netherlands] Two experiments were carried out to study the effect of different feeding levels and feeding frequencies in the culture of *Clarias lazera* (C.& V.) fingerlings from 0.5 to 10 g. It was found that 0.5 g fingerlings could reach an average weight of about 10 g in 3-4 weeks when they were fed continuously for 24 h per day or 12h at night at a daily rate of 8% of the biomass or more. A feeding level of 10% of the biomass appeared to be optimal, from the point of hygiene, growth rate and feed utilization parameters. Continuous feeding during part or all of the day clearly gave better growth than feeding two or four defined meals per day. When these preferred feeding regimes were practised, the feed conversion (wet weight) ranged from 0.65 to 0.97, the protein efficiency ratio from 2.14 to 3.04 and the productive protein value from 0.34 to 0.47. These values compare favourable with values reported for other cultured species, indicating that *C. lazera* fingerlings are efficient feed convertors. It could be calculated that, when the rations are readjusted only once a week, the high growth rates occurring in these experiments result in a considerable difference between the designated feeding rates and the actual feeding rates.

81-001750 Jayaram, M. G. and H. P. C. Shetty. FORMULATION, PROCESSING AND WATER STABILITY OF TWO NEW PELLETED FISH FEEDS. *Aquaculture* 23(1-4):355-359. Apr. 1981. SFA 26(3)
[Univ. Agric. Sci., Coll. Fish., Mangalore-575002, India]

81-001751 Joseph, D. PARTIAL REPLACEMENT OF CONCENTRATED FISH FOOD (PELLETS) WITH CHICKEN DROPPINGS. *Bamidgeh* 33(1):24-28. Mar. 1981. SFA 26(3)
[Minist. Agric., Extension Serv., Hadera Dist. Reg. Advis., Israel]

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

81-001752 Kawamura, G. and A. R. Castillo, Jr. A NEW DEVICE FOR RECORDING THE FEEDING ACTIVITY OF MILKFISH. *Bull. Jpn. Soc. Sci. Fish.* 47(1):141. Jan. 1981. SFA 26(3)
[Fac. Fish., Kagoshima Univ., Kagoshima 890, Japan]

81-001753 Kentouri, M. DONNEES PRELIMINAIRES SUR LES FACULTES D'ADAPTATION A UN ALIMENT INERTE (ZOOPLANCTON CONGELE)DES POST-LARVES DE 11 ESPECES DE POISSONS ET CRUSTACE MARINS. [PRELIMINARY DATA ON THE ABILITY OF POST-LARVAE OF 11 MARINE SPECIES OF FISH AND CRUSTACEA TO ADAPT TO A LIFELESS FOOD (FROZEN ZOOPLANKTON).] *Aquaculture* 23(1-4):73-82. Apr. 1981. In French With English summ. SFA 26(3)
[Stn. Biol. Mar. Lagunaire, Quai de Bosc prolongße, 34200 Sete, France] Through the feeding behaviour, growth and survival of 11 marine species previously fed on live prey, the effect of deprivation and adaptation to a lifeless food (frozen plankton) was indirectly observed. While easily accepted by *Pleuronectes platessa*, *Penaeus japonicus* and *Sargus vulgaris*, this food is refused by *Gobius* sp. and rejected by *Trigla corax*. For the other species, the period of adaptation varies from 2 h (*Sparus auratus*, *Scophthalmus maximus* and *Solea vulgaris*) to 10 days (*Dicentrarchus labrax* born in the laboratory). The best results of growth and survival are obtained with *P. japonicus*, then come *Mugil cephalus*, *S. auratus*, *Diplodus vulgaris* and *D. labrax*. In flatfish, the early growth is high but quickly reaches a standstill. Heavy mortalities are recorded in *S. vulgaris*. In spite of specific differences between their adaptative period, *S. auratus*, *D. labrax*, *D. vulgaris*, *M. cephalus* and *Anguilla anguilla* show their ability to locate a food supply and become used to it. On the contrary, *S. maximus*, *P. platessa*, *S. vulgaris*, *P. japonicus* are not interested.

81-001754 Kissil, G. W.; C. B. Cowey; J. W. Adron and R. H. Richards. PYRIDOXINE REQUIREMENTS OF THE GILTHEAD BREAM, *SPARUS AURATA*. *Aquaculture* 23(1-4):243-255. Apr. 1981. SFA 26(3)
[Maricult. Lab., Isr. Oceanogr. Limnol. Res., P.O. Box 1212, Elat, Israel]

81-001755 Kouřil, J. THE FEEDING OF CARP LARVAE IN WARMED WATER. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 59-63. 1981. SFA 26(3)
[Fish. Hydrobiol. Res. Inst., Vodňany, Czechoslovakia]

81-001756 Kuhlmann, D.; G. Quantz and U. Witt. REARING OF TURBOT LARVAE (*SCOPHTHALMUS MAXIMUS* L.) ON CULTURED FOOD ORGANISMS AND POSTMETAMORPHOSIS GROWTH ON NATURAL AND ARTIFICIAL FOOD. *Aquaculture* 23(1-4):183-196. Apr. 1981. SFA 26(3)
[Inst. Meereskd., Aussenstelle Bülk, D-2301 Dänischenhagen-Bülk, West Germany] Turbot larvae (*Scophthalmus maximus* L.) were fed with mass-cultured rotifers (*Brachionus plicatilis*) and copepods (*Eurytemora affinis* and *Acartia tonsa*). The fish preferred copepod nauplii to rotifers. Larvae reached metamophosis between days 30 and 36 at a length of 22 mm at temperatures between 13.2°C and 17.8°C. Survival rate was about 50% from day 3 to the end of metamorphosis. Postmetamorphosis growth was examined for 38 days under comparative feeding programmes using herring meat, living mysids, pelleted trout feed and combinations of trout feed plus mysids and herring meat plus mysids. Mean growth rates varied from 4.7% /d (trout dry feed). The addition of living mysids to the diets positively influenced the growth increase and food conversion rates.

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

81-001757 Lone, K. P. and A. J. Matty. UPTAKE AND DISAPPEARANCE OF RADIOACTIVITY IN BLOOD AND TISSUES OF CARP (*CYPRINUS CARPIO*) AFTER FEEDING ^{3}H-TESTOSTERONE. *Aquaculture* 24(3-4):315-326. June 1981. SFA 26(3)
[Dep. Biol. Sci., Univ. Aston, Birmingham B4 7ET, England]

81-001758 Papoutsoglou, S. E.; E. G. Papaparaskeva-Papoutsoglou and M. Alexis. RAINBOW TROUT GROWTH AND PRODUCTION IN RELATION TO WATER VOLUME UNIT. *Thalassographica* 3(2):43-52. Dec. 1980. SFA 26(3)
[Agric. Univ. Coll. Athens, Dep. Appl. Hydrobiol., Iera Odos 75, Votanicos-Athens, Greece]

81-001759 Plakas, S. M. and T. Katayama. APPARENT DIGESTIBILITIES OF AMINO ACIDS FROM THREE REGIONS OF THE GASTROINTESTINAL TRACT OF CARP (*CYPRINUS CARPIO*) AFTER INGESTION OF A PROTEIN AND A CORRESPONDING FREE AMINO ACID DIET. *Aquaculture* 24(3-4):309-314. June 1981. SFA 26(3)
[Dep. Aquacult. Sci. Pathol., Univ. R.I., Kingston 02881]

81-001760 Refstie, T. and E. Austreng. CARBOHYDRATE IN RAINBOW TROUT DIETS. III. GROWTH AND CHEMICAL COMPOSITION OF FISH FROM DIFFERENT FAMILIES FED FOUR LEVELS OF CARBOHYDRATE IN THE DIET. *Aquaculture* 25(1):35-49. July 1981. SFA 26(3)
[Dep. Anim. Genet. Breeding, Agric. Univ. Norway, 1432 Ås-NLH, Norway] Groups of rainbow trout (*Salmo gairdneri*) from five different families and five inbred groups were fed four diets similar in protein and energy content but differing in the percentage of metabolizable energy present as carbohydrate. The percentage of metabolizable energy from carbohydrate was 15, 26, 37 and 49%, respectively. Significant differences between fish families were found for growth, condition factor, chemical composition of the fish, relative liver weight, liver colour, digestibility of energy and N-free extracts, dressing percentage amount of intestinal fat and flesh colour. Interaction between diet and family was significant for relative liver weight and liver colour. There was no interaction between diet and family for growth, indicating that the prospects for selectively breeding a strain of rainbow trout specifically better able to utilize carbohydrate are not promising. Growth rate and condition factor increased with decreasing carbohydrate level in diet. The fish fed high levels of carbohydrate had less dry matter, fat and ash in the body, and higher percentage carbohydrate in the liver. They also had higher relative liver weights and more discoloured livers. The fish fed high levels of carbohydrate had significantly better apparent digestibility of energy and protein. There were no signigicant differences in mortality rate between the groups, and veterinary examination did not reveal any pathological differences in the fish fed different feeding regimes.

81-001761 Rumsey, G. L.; M. Cacace; R. R. Zall and D. J. Lisk. DAIRY-PROCESSING WASTES AS A REPLACEMENT PROTEIN SOURCE IN DIETS OF RAINBOW TROUT. *Prog. Fish-Cult.* 43(2):86-88. Apr. 1981. SFA 26(3)
[U.S. FWS, Tunison Lab. Fish. Nutr., Cortland, NY 13045]

81-001762 Rumsey, G. L.; W. H. Gutenmann and D. J. Lisk. CEMENT KILN DUST AS AN ADDITIVE IN THE DIETS OF RAINBOW TROUT. *Prog. Fish-Cult.* 43(2):88-90. Apr. 1981. SFA 26(3)
[U.S. FWS, Tunison Lab. Fish. Nutr., Cortland, NY 13045]

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

81-001763 Steffens, W. PROTEIN UTILIZATION BY RAINBOW TROUT (*SALMO GAIRDNERI*) AND CARP (*CYPRINUS CARPIO*): A BRIEF REVIEW. *Aquaculture* 23(1-4):337-345. Apr. 1981. SFA 26(3)
[Inst. Inland Fish., Berlin-Friedrichshagen 1162, East Germany] Appropriate and simple measures of the utlization of dietary protein by fish are PER (protein efficiency ratio) and PPV (Productive protein value). Protein utilization depends essentially on fish species and size, environmental factors, protein quality, level of dietary protein and of utilizable dietary energy, kind of energy source and amount of feed. From our present knowledge it appears that important fish species such as rainbow trout and carp are not inferior with regard to dietary protein utilization to terrestrial farm animals. The relationships described should be taken into consideration in aquaculture.

81-001764 Storebakken, T.; E. Austreng and K. Steenberg. A METHOD FOR DETERMINATION OF FEED INTAKE IN SALMONIDS USING RADIOACTIVE ISOTOPES. *Aquaculture* 24(1-2):133-142. May 1981. SFA 26(3)
[Dep. Poultry Fur Anim. Sci., Agric. Univ. Norway, N-1432, Ås-NLH, Å Norway] Feed labelled with the radioactive isotopes ^{131}I or ^{51}Cr was offered to rainbow trout (*Salmo gairdneri*), in order to test the value of these isotopes in determining feed intake of cultured salmonids. The isotopes were mixed into the feed in powder form as $Ag^{131}I$ and $^{51}Cr_2O_3$. The radioactive feed was offered to the fish over a period of 2 h. Then the ^{131}I and ^{51}Cr activities were measured directly from the outside of the fish. Later, the gastrointestinal tracts were dissected out, and their contents of radioactive feed determined by laboratory techniques. Statistical analyses of the experimental data showed that ^{131}I seemed to be a more suitable tracer than ^{51}Cr. The correlation between radioactivity measured directly under the stomachs and in the material taken from the gastrointestinal tracts were as high as r=0.99 ($P<0.001$). The regression $R = 2.3/1x10^4 M - 4.49/1x10^2$ was estimated from the ^{131}I results. *R* is the radioactivity (in µCi) of the ingested feed and *M* is the radioactivity (counts/10s) measured directly under the fish stomach. The equation can be applied for fish from about 25 g to 1 kg without corrections for fish size.

81-001765 Usher, R. R. II. and D. A. Bengtson. SURVIVAL AND GROWTH OF SHEEPSHEAD MINNOW LARVAE AND JUVENILES ON A DIET OF *ARTEMIA* NAUPLII. *Prog. Fish-Cult.* 43(2):102-105. Apr. 1981. SFA 26(3)
[Mar. Biol. Prog., Cent. Life Sci., Univ. New England, Biddeford, ME 04005]

81-001766 Yu, T. C. and R. O. Sinnhuber. USE OF BEEF TALLOW AS AN ENERGY SOURCE IN COHO SALMON (*ONCORHYNCHUS KISUTCH*) RATIONS. *Can. J. Fish. Aquatic Sci.* 38(3):367-370. Mar. 1981. In English with French summ. SFA 26(3)
[Dep. Food Sci. Technol., Oreg. State Univ., Corvallis 97331]

MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT

81-001767 Avnimelech, Y.; M. Lacher; A. Raveh and O. Zur. A METHOD FOR THE EVALUATION OF CONDITIONS IN A FISH POND SEDIMENT. *Aquaculture* 23(1-4):361-365. Apr. 1981. SFA 26(3)
[Fac. Agric. Eng., Technion, Isr. Inst. Technol., Haifa, Israel] Deterioration with time of fish pond sediments, due to accumulation of organic material and to the development of reducing conditions, affects the

MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT (CONTINUED)

81-001767 CONTINUED fish pond's fertility and economics. The conditions in the sediment were measured here by the extent of uptake of ^{32}P tagged mud by fish. Results obtained, consistent with chemical data, indicate that when the sediment is overloaded and anaerobic, grazing at the sediment is limited, even if large amounts of food are present.

81-001768 Kubů, F. POSSIBILITIES OF UTILIZING HEATED EFFLUENTS IN FISH CULTURE. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 65-70. 1981. SFA 26(3)
[Fish. Hydrobiol. Res. Inst., Vodňany, Czechoslovakia]

ENVIRONMENTAL ISSUES, GENERAL AND MISC.

81-001769 Rosenberg, D. M.; V. H. Resh; S. S. Balling; M. A. Barnby; J. N. Collins; D. V. Durbin; T. S. Flynn; D. D. Hart; G. A. Lamberti; E. P. McElravy; J. R. Wood; T. E. Blank; D. M. Schultz; D. L. Marrin and D. G. Price. RECENT TRENDS IN ENVIRONMENTAL IMPACT ASSESSMENT. *Can. J. Fish. Aquatic Sci.* 38(5):591-624. May 1981. In English with French summ. SFA 26(3)
[Can. Dep. Fish. Oceans, Freshwater Inst., 501 University Crescent, Winnipeg, MB R3T 2N6, Canada]

GENERAL LIMNOLOGY AND OCEANOGRAPHY

81-001770 Stockner, J. G. and A. C. Costella. THE PALEOLIMNOLOGY OF EIGHT SOCKEYE SALMON (*ONCORHYNCHUS NERKA*) NURSERY LAKES IN BRITISH COLUMBIA, CANADA. *Can. Tech. Rep. Fish. Aquatic Sci.* no. 979. iv + 93p. Oct. 1980. In English with French summ. SFA 26(3)
[Dep. Fish. Oceans, 4160 Marine Dr., West Vancouver, BC V7V 1N6, Canada] Short cores (<40 cm) were obtained with a 4-cm diameter Phleger corer from eight sockeye salmon (*Oncorhynchus nerka*) nursery lakes in British Columbia. Diatom abundance, A/C ratio and species composition indicated that all lakes except Quesnel Lake remained oligotrophic throughout the historical period covered by the short cores. Sedimentation and diatom influx rates were extremely low in all lakes with mean values of approximately 1.0 mm/yr and 0.50 X 10^7 frustules/cm^2/yr, respectively. There was an excellent correspondence between historical sockeye escapement values and diatom abundance in Quesnel Lake, providing additional support for the hypothesis that sockeye carcasses can contribute substantially to the nutrient budgets of some interior British Columbia lakes.

CHEMICAL LIMNOLOGY AND OCEANOGRAPHY

81-001771 Canfield, D. E., Jr. and R. W. Bachmann. PREDICTION OF TOTAL PHOSPHORUS CONCENTRATIONS, CHLOROPHYLL *a*, AND SECCHI DEPTHS IN NATURAL AND ARTIFICIAL LAKES. *Can. J. Fish. Aquatic Sci.* 38(4):414-423. Apr.

CHEMICAL LIMNOLOGY AND OCEANOGRAPHY (CONTINUED)

81-001771 CONTINUED 1981. In English with French summ. SFA 26(3)
[Sch. For. Resour. Conserv., Univ. Fla., Gainesville 32611]

81-001772 Staněk, Z.; M. Peňáz; J. Trnková and E. Wohlgemuth. RADIOACTIVE BACKGROUND IN PRINCIPAL COMPONENTS OF THE JIHLAVA RIVER ECOSYSTEM. *Folia Zool.* 29(4):371-384. 1980. SFA 26(3)
[Water Res. Inst., Brno, Czechoslovakia]

BENTHOS

81-001773 Elliott, J. M. and C. M. Drake. A COMPARATIVE STUDY OF FOUR DREDGES USED FOR SAMPLING BENTHIC MACROINVERTEBRATES IN RIVERS. *Freshwater Biol.* 11(3):245-261. June 1981. SFA 26(3)
[Freshwater Biol. Assoc., The Ferry House, Ambleside, Cumbria LA22 0LP, England]

81-001774 Wefring, D. R. and A. J. Hopwood. METHOD FOR COLLECTING INVERTEBRATE DRIFT FROM THE SURFACE AND BOTTOM IN LARGE RIVERS. *Prog. Fish-Cult.* 43(2):108-110. Apr. 1981. SFA 26(3)
[Dep. Biol. Sci., St. Cloud State Univ., St. Cloud, MN 56301]

PLANKTON

81-001775 Horner, R. R. and E. B. Welch. STREAM PERIPHYTON DEVELOPMENT IN RELATION TO CURRENT VELOCITY AND NUTRIENTS. *Can. J. Fish. Aquatic Sci.* 38(4):449-457. Apr. 1981. In English with French summ. SFA 26(3)
[Dep. Civil Eng., Univ. Wash., Seattle]

81-001776 McCauley, E. and J. Kalff. EMPIRICAL RELATIONSHIPS BETWEEN PHYTOPLANKTON AND ZOOPLANKTON BIOMASS IN LAKES. *Can. J. Fish. Aquatic Sci.* 38(4):458-463. Apr. 1981. In English with French summ. SFA 26(3)
[McGill Univ., Biol. Dep., 1205 Ave. Docteur Penfield, Montreal, PQ H3A 1B1, Canada]

PRIMARY PRODUCTION

81-001777 Elwood, J. W.; J. D. Newbold; A. F. Trimble and R. W. Stark. THE LIMITING ROLE OF PHOSPHORUS IN A WOODLAND STREAM ECOSYSTEM: EFFECTS OF P ENRICHMENT ON LEAF DECOMPOSITION AND PRIMARY PRODUCERS. *Ecology* 62(1):146-158. Feb. 1981. SFA 26(3)
[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

MORPHOLOGY

81-001778 Černý, K. THE EARLY DEVELOPMENT OF CHUB - *LEUCISCUS CEPHALUS* (L. 1758), RUDD - *SCARDINIUS ERYTHROPHTHALMUS* (L., 1758) AND ROACH - *RUTILUS RUTILUS* (L., 1758). *Acta Univ. Carol. Biol.* 1977(1-2):1-152. 1977. SFA 26(3)
[Dep. Syst. Zool., Charles Univ., Prague, Czechoslavakia]

81-001779 Bruslé, S. ULTRASTRUCTURE OF SPERMIOGENESIS IN *LIZA AURATA* RISSO, 1810 (TELEOSTEI, MUGILIDAE). *Cell Tissue Res.* 217(2):415-424. May 1981. SFA 26(3)
[Lab. Biol. Mar., Univ. Perpignan, Ave Villeneuve, F-66025 Perpignan Cedex, France]

81-001780 Ball, J. N. and T. F. C. Batten. PITUITARY AND MELANOPHORE RESPONSES TO BACKGROUND IN *POECILIA LATIPINNA* (TELEOSTEI): ROLE OF THE PARS INTERMEDIA PASS CELL. *Gen. Comp. Endocrinol.* 44(2):233-248. June 1981. SFA 26(3)
[Dep. Zool., Univ. Sheffield, Sheffield S10 2TN, England]

81-001781 Buynak, G. L. and H. W. Mohr, Jr. LARVAL DEVELOPMENT OF THE COMMON SHINER (*NOTROPIS CORNUTUS*) FROM NORTHEAST PENNSYLVANIA. *Proc. Pa. Acad. Sci.* 54(2):165-168. 1980. SFA 26(3)
[Ichthyological Assoc., Inc., R.D. 1, Berwick, PA 18603]

81-001782 Castle, P. H. J. LARVAE OF THE OPHICHTHID EEL GENUS *NEENCHELYS* IN THE INDO-PACIFIC. *Pac. Sci.* 34(2):165-171. Apr. 1980. SFA 26(3)
[Dep. Zool., Victoria Univ., Private Bag, Wellington, New Zealand]

81-001783 Chapman, G. B. ULTRASTRUCTURE OF THE LIVER OF THE FINGERLING RAINBOW TROUT *SALMO GAIRDNERI* RICHARDSON. *J. Fish Biol.* 18(5):553-567. May 1981. SFA 26(3)
[Dep. Biol., Georgetown Univ., Washington, DC 20057]

81-001784 Douglas, W. A. and W. J. R. Lanzing. COLOUR CHANGE AND VISUAL CUES IN THE SAND FLATHEAD, *PLATYCEPHALUS ARENARIUS* (RAMSAY AND OGILBY). *J. Fish Biol.* 18(6):619-628. June 1981. SFA 26(3)
[Sch. Biol. Sci., Univ. Sydney, Sydney, 2006 Australia]

81-001785 Ezeasor, D. N. and W. M. Stokoe. LIGHT AND ELECTRON MICROSCOPIC STUDIES ON THE ABSORPTIVE CELLS OF THE INTESTINE, CAECA AND RECTUM OF THE ADULT RAINBOW TROUT, *SALMO GAIRDNERI*, RICH. *J. Fish Biol.* 18(5):527-544. May 1981. SFA 26(3)
[Dep. Vet. Anat., Univ. Nigeria, Nsukka, Nigeria]

81-001786 Hickman, R. A. DENSITIES AND SWIMBLADDER DEVELOPMENT OF JUVENILE AMERICAN EELS, *ANGUILLA ROSTRATA* (LESUEUR) AS RELATED TO ENERGETICS OF MIGRATION. *J. Fish Biol.* 18(5):507-517. May 1981. SFA 26(3)
[Carnegie Hall, Bates Coll., Lewiston, ME 04240] Glass eels and elvers of the American eel were negatively buoyant. Those adapted to sea water were more dense (1.072 ± 0.001 g/cm^3) than those adapted to fresh water

MORPHOLOGY (CONTINUED)

81-001786 CONTINUED (1.061 ± 0.001 g/cm^3). Adaptation to fresh water increased relative body water content, but did not account for the observed decrease in total body density. Histological examination revealed the presence of a potentially functional swimbladder in the glass eels, although this hydrostatic organ did not become gas-filled until after freshwater residency had occurred. Calculation of lift as used in the selective tidal transport mechanism suggests that hydrodynamic compensation for horizontal swimming during the estuarine phase of migration is energetically adaptive.

81-001787 Kazantseva-Selezneva, A. A. THE SOFT OPERCULAR VALVE OF ACTINOPTERYGII. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(2):148-149. 1980. SFA 26(3)
[Paleontol. Inst., USSR Acad. Sci., Moscow, USSR]

81-001788 Kleckner, R. C. and W. H. Krueger. CHANGES IN SWIMBLADDER RETIAL MORPHOLOGY IN *ANGUILLA ROSTRATA* DURING PREMIGRATION METAMORPHOSIS. *J. Fish Biol.* 18(5):569-577. May 1981. SFA 26(3)
[Migratory Fish Res. Inst., Univ. Me., Orono 04469]

81-001789 Kulkarni, C. V. EGGS AND EARLY DEVELOPMENT OF TOR MAHSEER FISH. *J. Bombay Nat. Hist. Soc.* 77(1):70-75. Apr. 1980. SFA 26(3)
[B-4, Shardashram, Bhavani Shankar Rd., Bombay-400 028, India]

81-001790 Laale, H. W. *IN VITRO* SECONDARY SPREADING FROM DISSOCIATING BLASTODERM-DERIVED EMBRYONIC TISSUES OF THE ZEBRAFISH, *BRACHYDANIO RERIO*. *Can. J. Zool.* 59(5):812-822. May 1981. In English with French summ. SFA 26(3)
[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada]

81-001791 Laale, H. W. *IN VITRO* PRIMARY SPREADING AND DISSOCIATION OF ZEBRAFISH, *BRACHYDANIO RERIO*, BLASTODERM-DERIVED EMBRYONIC EPIDERMIS. *Can. J. Zool.* 59(5):800-811. May 1981. In English with French summ. SFA 26(3)
[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada]

81-001792 Laroche, W. A. DEVELOPMENT OF LARVAL SMOOTH FLOUNDER, *LIOPSETTA PUTNAMI*, WITH A REDESCRIPTION OF DEVELOPMENT OF WINTER FLOUNDER, *PSEUDOPLEURONECTES AMERICANUS* (FAMILY PLEURONECTIDAE). *NOAA Fish. Bull.* 78(4):897-909. Oct. 1980. SFA 26(3)
[Gulf Coast Res. Lab., P.O. Drawer AG, Ocean Springs, MS 39564]

81-001793 Leknes, I. L. ULTRASTRUCTURE OF MYOCARDIAL WIDENED Z BANDS AND ENDOCARDIAL CELLS IN TWO TELEOSTEAN SPECIES. *Cell Tissue Res.* 218(1):23-28. June 1981. SFA 26(3)
[Inst. Anat., Univ. Bergen, Årstadveien 19. N-5000 Bergen, Norway]

81-001794 Libosvárský, J.; R. Volskis; J. Wlodek and J. Gajdüšek. COMPARISON OF MORPHOMETRIC CHARACTERS OF VIMBA AND BREAM USING CORRELATION MATRICES. *Folia Zool.* 30(1):75-82. 1981. SFA 26(3)
[Inst. Vert. Zool., Czech. Acad. Sci., Brno, Czechoslovakia]

MORPHOLOGY (CONTINUED)

81-001795 Lindsey, C. C. and A. N. Arnason. A MODEL FOR RESPONSES OF VERTEBRAL NUMBERS IN FISH TO ENVIRONMENTAL INFLUENCES DURING DEVELOPMENT. *Can. J. Fish. Aquatic Sci.* 38(3):334-347. Mar. 1981. In English with French summ. SFA 26(3)
[Inst. Anim. Resour. Ecol., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

81-001796 Luecke, C. and W. J. O'Brien. PHOTOTOXICITY AND FISH PREDATION: SELECTIVE FACTORS IN COLOR MORPHS IN *HETEROCOPE*. *Limnol. Oceanogr.* 26(3):454-460. May 1981. SFA 26(3)
[Dep. Syst. Ecol., Univ. Kans., Lawrence 66045]

81-001797 Mallatt, J. THE SUSPENSION FEEDING MECHANISM OF THE LARVAL LAMPREY *PETROMYZON MARINUS*. *J. Zool. (Lond.)* 194(1):103-142. May 1981. SFA 26(3)
[Wash. State Univ., Dep. Zool., Pullman 99164]

81-001798 Matarese, A. C.; S. L. Richardson, and J. R. Dunn. LARVAL DEVELOPMENT OF PACIFIC TOMCOD, *MICROGADUS PROXIMUS*, IN THE NORTHEAST PACIFIC OCEAN WITH COMPARATIVE NOTES ON LARVAE OF WALLEYE POLLOCK, *THERAGRA CHALCOGRAMMA*, AND PACIFIC COD, *GADUS MACROCEPHALUS* (GADIDAE). *NOAA Fish. Bull.* 78(4):923-940. Oct. 1980. SFA 26(3)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

81-001799 Matsuura, T. and H. J. Herwig. HISTOCHEMICAL AND ULTRASTRUCTURAL STUDY OF THE NERVOUS ELEMENTS IN THE PINEAL ORGAN OF THE EEL, *ANGUILLA ANGUILLA*. *Cell Tissue Res.* 216(3):545-555. Apr. 1981. SFA 26(3)
[Dep. Anat., Kyoto Pref. Univ. Med., Kawaramachi Hirokoji, Kamikyo-ku, Kyoto, Japan]

81-001800 Menezes, N. A.; H.-J. Wagner and M. A. Ali. RETINAL ADAPTATIONS IN FISHES FROM A FLOODPLAIN ENVIRONMENT IN THE CENTRAL AMAZON BASIN. *Rev. Can. Biol.* 40(1):111-132. Mar. 1981. In English with French summ. SFA 26(3)
[Mus. Zool., Univ. São, Paulo, Caixa Postal 7172, 04263, São Paulo, Brazil]

81-001801 Meyer-Rochow, V. B. FISH TONGUES--SURFACE FINE STRUCTURES AND ECOLOGICAL CONSIDERATIONS. *Zool. J. Linn. Soc.* 71(4):413-426. Apr. 1981. SFA 26(3)
[Dep. Biol. Sci., Univ. Waikato, Hamilton, New Zeland]

81-001802 Mikodina, Ye. V. and A. P. Makeyeva. THE STRUCTURE AND SOME PROPERTIES OF EGG MEMBRANES IN PELAGOPHILOUS FRESHWATER FISHES. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(2):86-94. 1980. SFA 26(3)
[Dep. Ichthyol., Moscow Univ., USSR]

81-001803 Patzner, R. A. and H. Adam. CHANGES IN WEIGHT OF THE LIVER AND THE RELATIONSHIP TO REPRODUCTION IN THE HAGFISH *MYXINE GLUTINOSA* (CYCLOSTOMATA). *J. Mar. Biol. Assoc. U.K.* 61(2):461-464. May 1981. SFA 26(3)
[Zool. Inst., Univ. Salzburg, A-5020 Salzburg, Austria]

MORPHOLOGY (CONTINUED)

81-001804 Pavlov, A. F. A MORPHOMETRIC DESCRIPTION OF THE TUGUN, *COREGONUS TUGUN*, OF THE SEVERNAYA SOS'VA RIVER BASIN. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(2):24-34. 1980. SFA 26(3)
[GosNIORKh, Leningrad, USSR]

81-001805 Peňáz, M.; E. Wohlgemuth; J. Hamáčková and J. Kouřil. EARLY ONTOGENY OF THE TENCH, *TINCA TINCA* I. EMBRYONIC PERIOD. *Folia Zool.* 30(2):165-176. 1981. SFA 26(3)
[Inst. Vert. Zool., Czech. Acad. Sci., Brno, Czechoslovakia]

81-001806 Peňáz, M. ECOMORPHOLOGICAL PRINCIPLES AND SALTATION IN THE EARLY ONTOGENY OF SALMONOID FISHES. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 95-100. 1981. SFA 26(3)
[Inst. Vert. Zool., Czech. Acad. Sci., Brno, Czechoslovakia]

81-001807 Pearson, D. M. FUNCTIONAL ASPECTS OF THE INTEGUMENT IN POLYPTERID FISHES. *Zool. J. Linn. Soc.* 72(1):93-106. May 1981. SFA 26(3)
[15 De Villiers Ave., Liverpool L23 2TH, England]

81-001808 Peters, K. M. DEVELOPMENT OF TWO LABORATORY-REARED ESTUARINE GOBIID SPECIES. *Fla. Sci.* 44(Suppl. 1):21-22. 1981. Abstract only. SFA 26(3)
[Fla. Dep. Nat. Resour., 100 8th Ave. S.E., St. Petersburg 33701]

81-001809 Potter, W. A. and J. M. Potter. DESCRIPTION OF A PROTOLARVA MIMIC SHINER *(NOTROPIS VOLUCELLUS)*. *Ohio J. Sci.* 81(3):135-137. May 1981. SFA 26(3)
[Enviro. Control, Inc., 11300 Rockville Pike, Rockville, MD 208532

81-001810 Reist, J. D. VARIATION IN FREQUENCIES OF PELVIC PHENOTYPES OF THE BROOK STICKLEBACK, *CULAEA INCONSTANS*, IN REDWATER DRAINAGE, ALBERTA. *Can. Field-Nat.* 95(2):178-182. Apr.-June 1981. SFA 26(3)
[Dep. Ichthylol. Herpetol., Royal Ontario Mus., Toronto, ON M5S 2C6, Canada]

81-001811 Richardson, S. L. PELAGIC EGGS AND LARVAE OF THE DEEPSEA SOLE, *EMBASSICHTHYS BATHYBIUS* (PISCES: PLEURONECTIDAE), WITH COMMENTS ON GENERIC AFFINITIES. *NOAA Fish. Bull.* 79(1):163-170. Jan. 1981. SFA 26(3)
[Gulf Coast Res. Lab., East Beach Dr., Ocean Aprings, MS 39564]

81-001812 Richardson, S. L. CURRENT KNOWLEDGE OF LARVAE OF SCULPINS (PISCES: COTTIDAE AND ALLIES) IN NORTHEAST PACIFIC GENERA WITH NOTES ON INTERGENERIC RELATIONSHIPS. *NOAA Fish. Bull.* 79(1):103-121. Jan. 1981. SFA 26(3)
[Gulf Coast Res. Lab., East Beach Dr., Ocean Springs, MS 39564]

81-001813 Santos, G. M. dos. ASPECTOS DE SISTEMÁTICA E MORFOLOGIA DE *SCHIZODON FASCIATUS* AGASSIZ, 1829, *RHYTIODUS MICROLEPIS* KNER, 1859 E *RHYTIODUS ARGENTEOFUSCUS* KNER, 1829 (OSTEICHTHYES, CHARACOIDEI, ANOSTOMIDAE) DO LAGO JANAUACÁ - AMAZONAS. [ASPECTS OF SYSTEMATICS AND MORPHOLOGY OF *SCHIZODON FASCIATUS* AGASSIZ, 1829, *RHYTIODUS MICROLEPIS* KNER, 1859 AND *RHYTIODUS ARGENTEOFUSCUS* KNER, 1829

MORPHOLOGY (CONTINUED)

81-001813 CONTINUED (OSTEICHTHYES, CHARACOIDEI, ANOSTOMIDAE) IN LAKE JANAUACÁ, AMAZONIA.] *Acta Amazonica* 10(3):635-649. Sept. 1980. In Portuguèse with English summ. SFA 26(3)
[Inst. Nac. Pesq. Amazonia, Manaus, Brazil]

81-001814 Shapiro, D. Y. SEQUENCE OF COLORATION CHANGES DURING SEX REVERSAL IN THE TROPICAL MARINE FISH *ANTHIAS SQUAMIPINNIS* (PETERS). *Bull. Mar. Sci.* 31(2):383-398. Apr. 1981. SFA 26(3)
[Dep. Mar. Sci., Univ. Puerto Rico, Mayaguez 00708]

81-001815 Sharma, C. L. A BIOSTATISTICAL STUDY OF MYELENCEPHALON AND ITS PARTS IN THE DEVELOPMENTAL STAGES OF *CIRRHINA MRIGALA* (HAM). *J. Anim. Morphol. Physiol.* 27(1-2):70-77. June-Dec. 1980. SFA 26(3)
[P.G. Dep. Zool., S.S.L. Jain Coll., Vidisha (M.P.), India]

81-001816 Shevchenko, N. F. GEOGRAPHICAL VARIABILITY OF THE ANCHOVY, *ENGRAULIS ENCRASICHOLUS* (CLUPEIFORMES, ENGRAULIDAE), IN THE MEDITERRANEAN BASIN. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):15-24. 1980. SFA 26(3)
[INBYUM, Sevastopol, USSR] The variability of morphometric characters and some other characters of the anchovy in various regions of the Mediterranean Basin are studied. The data obtained indicate the geographical variability of the anchovy. The substantial differences of the characters studied show that the species *Engraulis encrasicholus* (Linne, 1758) is polytypic and forms subspecies in the different waters of the Mediterranean Basin.

81-001817 Suzuki, K.; S. Hioki; K. Kobayashi and Y. Tanaka. [DEVELOPING EGGS AND EARLY LARVAE OF THE WRASSES, *CIRRHILABRUS TEMMINCKII* AND *LABROIDES DIMIDIATUS*, WITH A NOTE ON THEIR SPAWNING BEHAVIORS.] *J. Fac. Mar. Sci. Technol. Tokai Univ.* No. 14. 369-377. 1981. In Japanese with English summ. SFA 26(3)
[Fac. Mar. Sci. Technol., Tokai Univ., Japan]

81-001818 Toor, H. S. and K. S. Chauhan. OCCURRENCE OF STOMACH IN MIRROR CARP--*CYPRINUS CARPIO SPECULARIS*. *Res. Bull. Panjab Univ. Sci.* 28(3-4):201-203. Dec. 1977. SFA 26(3)
[Dep. Zool., Panjab Agric. Univ., Ludhiana, India]

81-001819 Toor, H. S. and K. S. Chauhan. ABSENCE OF THE PELVIC FINS IN THE SCALE-CARP *CYPRINUS CARPIO COMMUNIS* LINNAEUS. *Res. Bull. Panjab Univ. Sci.* 28(3-4):211-212. Dec. 1977. SFA 26(3)
[Dep. Zool., Panjab Agric. Univ., Ludhiana, India]

81-001820 Vorob'jeva, E. I.; L. A. Sytina and V. V. Rubcov. ECO-MORPHOLOGICAL RESEARCH ON THE EARLY STAGES OF FISH ONTOGENESIS. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 153-157. 1981. SFA 26(3)
[A.N. Severcov Inst. Evol. Anim. Morphol. Ecol., USSR Acad. Sci., Moscow, USSR]

81-001821 Yano, I. SCANNING ELECTRON MICROSCOPIC STUDY ON THE COMB-LIKE TEETH OF *PLECOGLOSSUS ALITIVELIS* TEMMINCK ET SCHLEGEL. *Bull. Jpn. Soc. Sci. Fish.* 47(3):437. Mar. 1981. SFA 26(3)
[Natl. Res. Inst. Aquacult., Tamaki, Mie 519-04, Japan]

MORPHOLOGY (CONTINUED)

81-001822 Yevsin, V. N. MORPHOMETRIC FEATURES OF THE BROWN TROUT, *SALMO TRUTTA* MORPHA *FARIO*, OF THE PULON'GA RIVER. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(2):16-23. 1980. SFA 26(3)
[Dep. Zool. Darwinism, Petrozavodsk Univ., USSR]

81-001823 Yoshikawa, H. and M. Oguri. OVARIAN DIFFERENTIATION IN THE MEDAKA, *ORYZIAS LATIPES*, WITH SPECIAL REFERENCE TO THE GRADIENT OF THE DIFFERENTIATION. *Bull. Jpn. Soc. Sci. Fish.* 47(1):43-50. Jan. 1981. SFA 26(3)
[Fish. Lab, Fac. Agric., Nagoya Univ., Furo, Nagoya 464, Japan]

81-001824 Zapata, A. and A. Carrato. ULTRASTRUCTURE OF ELASMOBRANCH AND TELEOST ERYTHROCYTES. *Acta Zool. (Stockh.)* 62(2):129-135. 1981. SFA 26(3)
[Dep. Morfol. Microsc., Fac. Biol., Univ. Complutense, Madrid 3, Spain]

81-001825 Zolotnitskiy, A. P. THE MORPHOFUNCTIONAL CHARACTERISTICS OF THE HYPOTHALAMO-HYPOPHYSEAL NEUROSECRETORY SYSTEM OF THE "BLACK SEA TURBOT", *SCOPHTHALMUS MAEOTICUS*, IN CONNECTION WITH THE REPRODUCTIVE CYCLE. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(2):104-111. 1980. SFA 26(3)
[AzcherNIRO, Kerch, USSR]

PHYSIOLOGY

81-001826 Abe, H. SIMILARITY BETWEEN ALKALINE PHOSPHATASE AND NUCLEOTIDE PYROPHOSPHATASE FROM SKIPJACK LIVER. *Bull. Jpn. Soc. Sci. Fish.* 47(2):275-280. Feb. 1981. SFA 26(3)
[Lab. Chem., Fac. Home Econ., Kyoritsu Women's Univ., Motohachioji, Hachioji 193, Tokyo, Japan]

81-001827 Abrahamsson, T.; A.-C. Jönsson and S. Nilsson. ACTIVITY OF DOPAMINE-β-HYDROXYLAS (DBH) AND PHENYLETHANOLAMINE-N-METHYL TRANSFERASE (PNMT) IN HEART, LUNG AND CHROMAFFIN TISSUE FROM THE FLORIDA SPOTTED GAR, *LEPISOSTEUS PLATYRHINCUS* (HOLOSTEI). *Acta Physiol. Scand.* 111(4):431-433. Apr. 1981. SFA 26(3)
[Dep. Zoophysiol., Univ. Göteborg, Box 250 59, S-400 31, Göteborg, Sweden]

81-001828 Agrawal, N. K. and C. L. Mahajan. EFFECT OF ASCORBIC ACID DEFICIENCY ON THE UPTAKE OF IODINE BY THYROID AND NON-THYROID TISSUES OF AN AIR-BREATHING FRESHWATER FISH *CHANNA PUNCTATUS* BLOCH. *J. Fish Biol.* 18(4):411-416. Apr. 1981. SFA 26(3)
[Dep. Zool., Univ. Rajasthan, Jaipur 302004, India] Using ^{131}I as tracer, iodine uptake by various thyroid and non-thyroid tissues has been reported in *Channa punctatus* in which vitamin C deficiency was experimentally induced by feeding vitamin C deficient diet to a level when morphological deficiency syndromes appeared. This was compared with a parallel control, fed a complete diet. The study showed a highly significant decrease in iodine uptake by thyroid tissues in vitamin C deficient fish as compared to the control. However, the blood and other non-thyroid tissues recorded a significant increase in absorption and distribution of iodine. These findings suggested hypofunctioning of thyroid gland due to a prolonged deficiency of vitamin C.

PHYSIOLOGY (CONTINUED)

81-001829 Alt, J. M.; H. Stolte; G. M. Eisenbach and F. Walvig. RENAL ELECTROLYTE AND FLUID EXCRETION IN THE ATLANTIC HAGFISH *MYXINE GLUTINOSA*. *J. Exp. Biol.* 91:323-330. Apr. 1981. SFA 26(3)
[Med. Sch. Hannover, Dep. Med., Hannover, West Germany]

81-001830 Balashov, N. V.; R. R. Fänge; V. A. Govyrin, G. R. Leont'eva; S. Nilsson and M. P. Prozorovskaya. *Acta Physiol. Scad.* 111(4):435-440. Apr. 1981. SFA 26(3)
[S. Nilsson: Dep. Zoophysiol., Box 250 59, S-400 31, Göteborg, Sweden]

81-001831 Ball, J. N. HYPOTHALAMIC CONTROL OF THE PARS DISTALIS IN FISHES, AMPHIBIANS, AND REPTILES. *Gen. Comp. Endocrinol.* 44(2):135-170. June 1981. SFA 26(3)
[Dep. Zool., Univ. Sheffield, Sheffield S10 2TN, England]

81-001832 Baugh, T. M. and B. G. Brown. FIELD OBSERVATIONS ON THE RESPONSE OF THE RAILROAD VALLEY SPRINGFISH (*CRENICHTHYS NEVADAE*) TO TEMPERATURE. *Great Basin Nat.* 40(4):359-360. 31 Dec. 1980. SFA 26(3)
[1020 Custer Ave., Ogden, UT 84404]

81-001833 Bhatt, S. D. EFFECT OF GLUCOSE LOADING ON THE GLYCOGEN CONTENT IN SOME TISSUES OF *CLARIAS BATRACHUS* (L). *J. Anim. Morphol. Physiol.* 27(1-2):267-272. June-Dec. 1980. SFA 26(3)
[Dep. Zool., Kumaun Univ., Almora Campus, Almora-263601, India]

81-001834 Bogé, G.; R. Rigal and G. Pérès. RATES OF *IN VIVO* INTESTINAL ABSORPTION OF GLYCINE AND GLYCYLGLYCINE BY RAINBOW TROUT (*SALMO GAIRDNERI* R.). *Comp. Biochem. Physiol. A Comp. Physiol.* 69(3):455-459. 1981. SFA 26(3)
[Lab. Marit. Physiol., Inst. Michel Paca, 83500, Tamaris sur Mer, France]

81-001835 Bogé, G; A. Rigal and G. Pérès. A STUDY OF *IN VIVO* GLYCINE ABSORPTION BY FED AND FASTED RAINBOW TROUT (*SALMO GAIRDNERI*). *J. Exp. Biol.* 91:285-292. Apr. 1981. SFA 26(3)
[Lab. Marit. Physiol., Inst. Michel Pacha, 83500-Tamaris sur Mer, France]

81-001836 Borg, B. EFFECTS OF METHYLTESTOSTERONE ON SPERMATOGENESIS AND SECONDARY SEXUAL CHARACTERS IN THE THREE-SPINED STICKLEBACK (*GASTEROSTEUS ACULEATUS* L.). *Gen. Comp. Endocrinol.* 44(2):177-180. June 1981. SFA 26(3)
[Dep. Zool., Univ. Lund, Helgonavägen 3, S-223 62 Lund, Sweden]

81-001837 Bowen, S. H. DIGESTION AND ASSIMILATION OF PERIPHYTIC DETRITAL AGGREGATE BY *TILAPIA MOSSAMBICA*. *Trans. Am. Fish. Soc.* 110(2):239-245. Mar. 1981. SFA 26(3)
[Dep. Biol. Sci., Mich. Technol. Univ., Houghton 49931]

81-001838 Breepoel, P. M.; F. Kreuzer and M. Kazevoet. STUDIES OF THE HEMOGLOBINS OF THE EEL (*ANGUILLA ANGUILLA* L.)-II. PROTON BINDING OF A COMPONENT WITH A NEGATIVE BOHR EFFECT. *Comp. Biochem. Physiol. A Comp.*

PHYSIOLOGY (CONTINUED)

81-001838 CONTINUED *Physiol.* 69(2):225-230. 1981. SFA 26(3)
[Dep. Physiol., Fac. Med., Catholic Univ., Nijmegen, The Netherlands]

81-001839 Brett, J. R. and J. M. Blackburn. OXYGEN REQUIREMENTS FOR GROWTH OF YOUNG COHO (*ONCORHYNCHUS KISUTCH*) AND SOCKEYE (*O. NERKA*) SALMON AT 15°C. *Can. J. Fish. Aquatic Sci.* 38(4):399-404. Apr. 1981. In English with French summ. SFA 26(3)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

81-001840 Brummett, A. R. and J. N. Dumont. CORTICAL VESICLE BREAKDOWN IN FERTILIZED EGGS OF *FUNDULUS HETEROCLITUS*. *J. Exp. Zool.* 216(1):63-79. Apr. 1981. SFA 26(3)
[Dep. Biol., Oberlin Coll., Oberlin, OH 44074]

81-001841 Busacker, G. P. and W. Chavin. CHARACTERIZATION OF $Na^+ + K^+$-ATPASES AND Mg^{2+}-ATPASES FROM THE GILL AND THE KIDNEY OF THE GOLDFISH (*CARASSIUS AURATUS* L.). *Comp. Biochem. Physiol. B Comp. Biochem.* 69(2):249-256. 1981. SFA 26(3)
[Dep. Biol. Sci., Wayne State Univ., Detroit, MI 48202]

81-001842 Chung, K. S. RATE OF ACCLIMATION OF THE TROPICAL SALT-MARSH FISH *CYPRINODON DEARBORNI* TO TEMPERATURE CHANGES. *Hydrobiologica* 78(2):177-181. 6 Mar. 1981. SFA 26(3)
[Inst. Oceanogr., Univ. Oriente, Cumaná, Venezuela]

81-001843 Cloud, J. G. DEOXYCORTICOSTERONE-INDUCED PRECOCIOUS HATCHING OF TELEOST EMBRYOS. *J. Exp. Zool.* 216(1):197-199. Apr. 1981. SFA 26(3)
[Dep. Biol. Sci., Univ. Idaho, Moscow 83843]

81-001844 Cohen, T.; A. Gertler and Y. Birk. PANCREATIC PROTEOLYTIC ENZYMES FROM CARP (*CYPRINUS CARPIO*)--II. KINETIC PROPERTIES AND INHIBITION STUDIES OF TRYPSIN, CHYMOTRYPSIN AND ELASTASE. *Comp. Biochem. Physiol. B Comp. Biochem.* 69(3):647-653. 1981. SFA 26(3)
[Dep. Agric. Biochem., Fac. Agric., Hebrew Univ., Rehovot, Israel]

81-001845 Cohen, T.; A. Gertler and Y. Birk. PANCREATIC PROTEOLYTIC ENZYMES FROM CARP (*CYPRINUS CARPIO*)--I. PURIFICATION AND PHYSICAL PROPERTIES OF TRYPSIN, CHYMOTRYPSIN, ELASTASE AND CARBOXYPEPTIDASE B. *Comp. Biochem. Physiol. B Comp. Biochem.* 69(3):639-646. 1981. SFA 26(3)
[Dep. Agric. Biochem., Fac. Agric., Hebrew Univ., Rehovot, Israel]

81-001846 Cornillon, B.; R. Létoublon; J. Frot-Coutaz and R. Got. MANNOSE TRANSFER FROM GDP-MANNOSE TO LIPIDS AND PROTEINS IN TROUT LIVER MICROSOMES (*SALMO GAIRDNERI*). *Comp. Biochem. Physiol. B Comp. Biochem.* 69(2):231-236. 1981. SFA 26(3)
[Lab. Biol. Technol. Membranes, Univ. Claude Bernard Lyon, 43 Bd. 11 Novembre 1918, 69622 Villeurbanne Cedex, France]

PHYSIOLOGY (CONTINUED)

81-001847 Crim, L. W.; R. E. Peter and R. Billard. ONSET OF GONADOTROPIC HORMONE ACCUMULATION IN THE IMMATURE TROUT PITUITARY GLAND AND RESPONSE TO ESTROGEN OR AROMATIZABLE ANDROGEN STEROID HORMONES. *Gen. Comp. Endocrinol.* 44(3):374-381. July 1981. SFA 26(3)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's NF A1C 5S7, Canada]

81-001848 Dabrowski, K. and H. Dabrowska. DIGESTION OF PROTEIN BY RAINBOW TROUT (*SALMO GAIRDNERI* RICH.) AND ABSORPTION OF AMINO ACIDS WITHIN THE ALIMENTARY TRACT. *Comp. Biochem. Physiol. A Comp. Physiol.* 69(1):99-111. 1981. SFA 26(3)
[Inst. Ichthyobiol. Fish., Acad. Agric. Technol., 10-957 Olsztyn-Kortowo, Poland]

81-001849 Demael, A.; D. Garin and D. Lepot. INFLUENCE OF WATER QUALITY ON THE METABOLIC RESPONSES OF A CYPRINID (*TINCA TINCA* L.) SUBJECTED TO HEAT SHOCK. *J. Therm. Biol.* 6(2):65-71. Apr. 1981. SFA 26(3)
[Lab. Physiol. Gen. Comp., Univ. Claude Bernard, Lyon I, F-69 622, Villeurbanne Cedex, France] The presence of a raised potassium concentration in the water modifies the homeostatic equilibrium of the tench. A 10°C heat shock (15→25°C) lasting for 30 min. acts both on fish in normal water and those in water with a high potassium content. In normal water tench, the temperature change causes a momentary loss of plasma ionic equilibrium, combined with hyperglycemia and degradation of tissue glycogen. Glycogen deposits are reconstituted from protein molecules. In raised potassium water tench, the plasma ion content is much lower, in spite of a permanent hypercortisolaemia, and the fish do not restore their initial inonogram 48 h after the heat shock. The presence of raised potassium concentration in the water does not appear to modify the effects of a heat shock, but merely to prolong them.

81-001850 DiMichele, L.; M. H. Taylor and R. Singleton, Jr. THE HATCHING ENZYME OF *FUNDULUS HETEROCLITUS*. *J. Exp. Zool.* 216(1):133-140. Apr. 1981. SFA 26(3)
[Sch. Life Health Sci., Univ. Del., Newark 19711]

81-001851 Dindo, J. J. and R. MacGregor III. ANNUAL CYCLE OF SERUM GONADAL STEROIDS AND SERUM LIPIDS IN STRIPED MULLET. *Trans. Am. Fish. Soc.* 110(3):403-409. May 1981. SFA 26(3)
[Dep. Biol., Univ. Ala., Birmingham 35294]

81-001852 Doneen, B. A. and D. H. Gutmann. LIPID COMPOSITION AND *IN VITRO* BIOSYNTHETIC RATES OF NEUTRAL LIPIDS AND PHOSPHATIDYLCHOLINE IN ANTERIOR AND POSTERIOR CHAMBERS OF THE GOLDFISH SWIMBLADDER. *Comp. Biochem. Physiol. A Comp. Physiol.* 69(2):291-295. 1981. SFA 26(3)
[Div. Biol. Sci., Univ. Mich., Ann Arbor 48109]

81-001853 Douglas, W. A. and W. J. R. Lanzing. THE RESPIRATORY MECHANISMS OF THE DUSKY FLATHEAD, *PLATYCEPHALUS FUSCUS* (PLATYCEPHALIDAE, SCORPAENIFORMES). *J. Fish Biol.* 18(5):545-552. May 1981. SFA 26(3)
[Sch. Biol. Sci., Univ. Sydney, Sydney, N.S.W., Australia 2006]

81-001854 Driedzic, W. R.; G. McGuire and M. Hatheway. METABOLIC ALTERATIONS ASSOCIATED WITH INCREASED ENERGY DEMAND IN FISH WHITE MUSCLE. *J. Comp. Physiol. B Biochem. Syst. Environ. Physiol.* 141(4):425-432. Mar.

PHYSIOLOGY (CONTINUED)

81-001854 CONTINUED 1981. SFA 26(3)
[Dep. Biol., Mount Allison Univ., Sackville, NB E0A 3C0, Canada]

81-001855 Driedzic, W. R.; G. McGuire and M. Hatheway. METABOLIC ALTERATIONS ASSOCIATED WITH INCREASED ENERGY DEMAND IN FISH WHITE MUSCLE. *J. Comp. Physiol. B Biochem. Syst. Environ. Physiol.* 141(4):425-432. Mar. 1981. SFA 26(3)
[Dep. Biol., Mount Allison Univ., Sackville, NB E0A 3C0, Canada]

81-001856 Dzhumaliyev, M. K. THE CAPILLARY BLOOD SUPPLY TO THE OESOPHAGUS AND THE CARDIAC PORTION OF THE STOMACH IN FISHES OF SEVERAL ORDERS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):62-67. 1980. SFA 26(3)
[Kazakh Univ., Alma-Ata, USSR]

81-001857 Eddy, F. B.; O. S. Bamford and G. M. O. Maloiy. Na^+ AND Cl^- EFFLUXES AND IONIC REGULATION IN *TILAPIA GRAHAMI*, A FISH LIVING IN CONDITIONS OF EXTREME ALKALINITY. *J. Exp. Biol.* 91:349-353. Apr. 1981. SFA 26(3)
[Dep. Biol. Sci., The University, Dundee DD1 4HN, U.K.]

81-001858 Fänge, R. and A. Mattisson. THE LYMPHOMYELOID (HEMOPOIETIC) SYSTEM OF THE ATLANTIC NURSE SHARK, *GINGLYMOSTOMA CIRRATUM*. *Biol. Bull.(Woods Hole)* 160(2):240-249. Apr. 1981. SFA 26(3)
[Dep. Zoophysiol., Univ. Göteborg, Sweden]

81-001859 Farrell, A. P. and D. G. Smith. MICROVASCULAR PRESSURES IN GILL FILAMENTS OF LINGCOD (*OPHIODON ELONGATUS*). *J. Exp. Zool.* 216(2):341-344. May 1981. SFA 26(3)
[Biol. Dep., Mt. Allison Univ., Sackville, NB E0A 3C0, Canada]

81-001860 Farrell, A. P. CARDIOVASCULAR CHANGES IN THE LINGCOD (*OPHIODON ELONGATUS*) FOLLOWING ADRENERGIC AND CHOLINERGIC DRUG INFUSIONS. *J. Exp. Biol.* 91:293-305. Apr. 1981. SFA 26(3)
[Dep. Biol., Univ. Mt. Allison, Sackville, NV E0A 3C0, Canada]

81-001861 Folmar, L. C. and W. W. Dickhoff. EVALUATION OF SOME PHYSIOLOGICAL PARAMETERS AS PREDICTIVE INDICES OF SMOLTIFICATION. *Aquaculture* 23(1-4):309-324. Apr. 1981. SFA 26(3)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112] During smoltification of coho salmon (*Oncorhynchus kisutch*) in freshwater (April-May), dramatic increases in both plasma T_4 and gill Na+-K+ ATPase activities were observed and found to be significantly related. Plasma T_3 levels increased in some groups during this period and, overall, were significantly correlated with both plasma T_4 and gill Na+-K+ ATPase. A significant decrease in plasma Na+ and Cl- concentrations was observed in some groups. Transfer to seawater resulted in significant increases in gill Na+-K+ ATPase activity during the first 8 d of seawater residence. In contrast, plasma T_4 and T_3 concentrations showed variable response. Plasma concentrations of the thyroid hormones were significantly correlated with one another, but unrealted to ATPase activities. The lack of a significant relationship between plasma T_4 concentrations and gill Na+-K+ ATPase in seawater suggests that they may be freshwater developmental phenomena which prepare the fish to seawater entry rather than serving as regulatory

PHYSIOLOGY (CONTINUED)

81-001861 CONTINUED mechanisms after seawater entry. All hatchery groups showed rapid increase in both plasma Na+ and Cl- during the first or second day of residence in seawater. All physiological measurements obtained in both fresh water and seawater were compared with the number of surviving and smolted fish after 6 months in seawater. Only one relationship, a component of the plasma T_4 curve from fish in fresh water and percentage survival, was found to be significant. The usefulness of this comparison in predicting hatchery release dates is discussed.

81-001862 Forster, M. E. OXYGEN CONSUMPTION AND APNOEA IN THE SHORTFIN EEL, *ANGUILLA AUSTRALIS SCHMIDTII. N.Z. J. Mar. Freshwater Res.* 15(1):85-90. 1981. SFA 26(3)
[Dep. Zool., Univ. Canterbury, Christchurch I, New Zealand]

81-001863 Frick, L. THE EVOLUTION OF CYTOSOLIC DIPEPTIDASES AND TRIPEPTIDASES OF FISHES. *Pac. Sci.* 34(3):329-330. July 1980. Abstract only. SFA 26(3)
[Univ. Hawaii, Dep. Zool., Honolulu 96822]

81-001864 Fujio, Y. and S. Kaneko. DIFFERENTIATION OF LACTATE DEHYDROGENASE ISOZYMES IN FISH. *Tohoku J. Agric. Res.* 31(2):61-73. Oct. 1980. SFA 26(3)
[Dep. Fish. Sci., Fac. Agric., Tohoku Univ., Sendai, Japan]

81-001865 Furspan, P. B. ENERGETICS AND OSMOREGULATION IN THE CATFISH; *ICTALURUS NEBULOSUS* AND *I. PUNCTATUS. Ph.D. dissertation, Indiana Univ.* 61p. 1981. From Diss. Abstr. Int. B Sci. Eng. 41(12):4403. June 1981. SFA 26(3)

81-001866 Gooding, R. M.; W. H. Neill and A. E. Dizon. RESPIRATION RATES AND LOW-OXYGEN TOLERANCE LIMITS IN SKIPJACK TUNA, *KATSUWONUS PELAMIS. NOAA Fish. Bull.* 79(1):31-48. Jan. 1981. SFA 26(3)
[NMFS, 2570 Dole St., Honolulu, HI 96812]

81-001867 Griffith, R. W. COMPOSITION OF THE BLOOD SERUM OF DEEP-SEA FISHES. *Biol. Bull. (Woods Hole)* 160(2):250-264. Apr. 1981. SFA 26(3)
[Dep. Biol., Southeast. Mass. Univ., North Dartmouth 02747]

81-001868 Hansson, T. and J. Gustafsson. SEX DIFFERENCES IN THE HEPATIC *IN VITRO* METABOLISM OF 4-ANDROSTENE-3, 17-DIONE IN RAINBOW TROUT, *SALMO GAIRDNERII. Gen. Comp. Endocrinol.* 44(2):181-188. June 1981. SFA 26(3)
[Dep. Zoophysiol., Univ. Gothenburg, Sweden]

81-001869 Haresign, T. W. and S. E. Shumway. PERMEABILITY OF THE MARSUPIUM OF THE PIPEFISH *SYNGNATHUS FUSCUS* TO [^{14}C]-ALPHA AMINO ISOBUTYRIC ACID. *Comp. Biochem. Physiol. A Comp. Physiol.* 69(3):603-604. 1981. SFA 26(3)
[Nat. Sci. Div., Southampton Coll., Southampton, NY 11968] Male pipefish, *Syngnathus fuscus*, with embryos were injected with a radioactively labelled non-metabolizable amino acid and accumulation of the acid monitored in the developing embryos. Evidence is presented for the transfer of the amino acid from paternal tissue to developing young.

PHYSIOLOGY (CONTINUED)

81-001870 Hastings, P. A. GONAD MORPHOLOGY AND SEX SUCCESSION IN THE PROTOGYNOUS HERMAPHRODITE *HEMANTHIAS VIVANUS* (JORDAN AND SWAIN). *J. Fish Biol.* 18(4):443-454. Apr. 1981. SFA 26(3)
[Dep. Ecol. Evol. Biol., Univ. Ariz., Tucson 85721]

81-001871 Hata, K.; M. Tanno and T. Kaneda. DECOMPOSITION OF LINOLEIC ACID HYDROPEROXIDE IN CARP INTESTINE. *Bull. Jpn. Soc. Sci. Fish.* 47(1):51-56. Jan. 1981. SFA 26(3)
[Dep. Food Chem., Fac. Agric., Tohuku Univ., Tsutsumidori-Amamiyamachi, Sendai 980, Japan]

81-001872 Hay, D. E. and D. N. Outram. ASSESSING AND MONITORING MATURITY AND GONAD DEVELOPMENT IN PACIFIC HERRING. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 998. v + 31p. Feb. 1981. In English with French summ. SFA 26(3)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

81-001873 Hayashi, K. and T. Takagi. DISTRIBUTION OF SQUALENE AND DIACYL GLYCERYL ETHERS IN THE DIFFERENT TISSUES OF DEEP-SEA SHARK, *DALATIAS LICHA*. *Bull. Jpn. Soc. Sci. Fish.* 47(2):281-288. Feb. 1981. SFA 26(3)
[Fac. Fish., Hokkaido Univ., Hakodate 041, Japan]

81-001874 Hofer, R. and F. Schiemer. PROTEOLYTIC ACTIVITY IN THE DIGESTIVE TRACT OF SEVERAL SPECIES OF FISH WITH DIFFERENT FEEDING HABITS. *Oecologia (Berl.)* 48(3):342-345. Mar. 1981. SFA 26(2)
[Inst. Zoophysiol., Univ. Innsbruck, Austria]

81-001875 Ingermann, R. L. and R. C. Terwilliger. OXYGEN AFFINITIES OF MATERNAL AND FETAL HEMOGLOBINS OF THE VIVIPAROUS SEAPERCH, *EMBIOTOCA LATERALIS*. *J. Comp. Physiol. B Biochem. Syst. Environ. Physiol.* 142(4):523-531. 11 May 1981. SFA 26(3)
[Dep. Biol., Oreg. Inst. Mar. Biol., Univ. Oreg., Charleston 97420]

81-001876 Jönsson, A.-C. and S. Nilsson. AXONAL TRANSPORT AND SUBCELLULAR DISTRIBUTION OF DOPAMINE-β-HYDROXYLASE IN THE COD, *GADUS MORHUA*. *Acta Physiol. Scand.* 11(4):441-445. Apr. 1981. SFA 26(3)
[Dep. Zoophysiol., Univ. Göteborg, Box 250 59, S-400 31, Göteborg, Sweden]

81-001877 Jackson, A. J. OSMOTIC REGULATION IN RAINBOW TROUT (*SALMO GAIRDNERI*) FOLLOWING TRANSFER TO SEA WATER. *Aquaculture* 24(1-2):143-151. May 1981. SFA 26(3)
[Dunstaffnage Mar. Res. Lab., Oban, Argyll, Scotland] The osmotic stress induced by subben transfer of rainbow trout from fresh water to sea water was studied. Increasing salinity and decreasing weight were shown adversely to affect their ability to adapt, and high plasma osmotic concentrations were shown to coincide with loss of appetite and eventually death. The rate of rise in the plasma osmotic concentration during the first 20 h was shown to be a crucial factor, a gradient of 5 mOsm/l/h or greater resulting in high mortalities. A linear relationship between increasing salinity and increasing gradient up to 28°/oo for 30 g fish was demonstrated; above 28°/oo, however, there was a drastic increase in gradient, indicating severe adaptation problems for fish of this size in full-strength sea water.

PHYSIOLOGY (CONTINUED)

81-001878 Jobling, M. THE INFLUENCES OF FEEDING ON THE METABOLIC RATE OF FISHES: A SHORT REVIEW. *J. Fish Biol.* 18(4):385-400. Apr. 1981. SFA 26(3)
[Inst. Fisker., Univ. Tromsø, N-9001, Tromsø, Norway] Following feeding, the rate of oxygen consumption of fishes increases to a peak and then slowly declines to the pre-feeding level. Many factors have been shown to influence the magnitude and duration of post-prandial oxygen consumption and these include quantity and/or quality of ration and environmental temperature. The effects of the various factors are described and the phenomenon of the post-prandial increase in metabolic rate of fish is discussed in relation to work with other species of animals.

81-001879 Jobling, M. THE INFLUENCES OF FEEDING ON THE METABOLIC RATE OF FISHES: A SHORT REVIEW (NOTE ADDED IN PROOF). *J. Fish Biol.* 18(5):615. May 1981. SFA 26(3)
[Inst. Fisker., Univ. Tromsø, N-9001, Tromsø, Norway]

81-001880 Johnson, L. THE THERMODYNAMIC ORIGIN OF ECOSYSTEMS. *Can. J. Fish. Aquatic Sci.* 38(5):571-590. May 1981. In English with French summ. SFA 26(3)
[Freshwater Inst., Dep. Fish. Oceans, 501 University Crescent, Winnipeg, MB R3T 2N6, Canada]

81-001881 Kanda, T. and Y. Itazawa. [GROUP EFFECT ON OXYGEN CONSUMPTION AND GROWTH OF THE CATFISH EEL.] *Bull. Jpn. Soc. Sci. Fish.* 47(3):341-345. Mar. 1981. In Japanese with English summ. SFA 26(3)
[Dep. Fish., Fac. Agric., Kyushu Univ., 46-04, Hakozaki, Higashi-ku, Fukuoka 812, Japan]

81-001882 Kapur, K. SEASONAL FLUCTUATIONS IN THE OVARIAN HYDRATION AND PROTEIN CONTENTS IN THE MAJOR INDIAN CARP, *LABEO ROHITA*, UNDER NATURAL AND CONFINED WATERS. *J. Anim. Morphol. Physiol.* 27(1-2):172-179. June-Dec. 1980. SFA 26(3)
[Dep. Zool., Punjab Agric. Univ., Ludhiana India-141004, India]

81-001883 Kashin, S. M.; R. W. Brill; W. N. Ikehara and A. E. Dizon. INDUCED LOCOMOTION BY MIDBRAIN STIMULTION IN RESTRAINED SKIPJACK TUNA, *KATSUWONUS PELAMIS*, L. *J. Exp. Zool.* 216(2):327-329. May 1981. SFA 26(3)
[R. W. Brill: Pac. Gamefish Found., Honolulu, HI 96825] We show that electrical stimulation of the midbrain of restrained and sedated skipjack tuna (*Katsuwonus pelamis*) produces coordinated locomotory activity. Therefore, our preparation is a viable alternative for creating normal swimming movements which can be closely controlled by the experimentalist, and demonstrates that a midbrain "locomotory center" is present in skipjack tuna, as in other teleosts.

81-001884 Kawamura, T. and S. Yamashita. CHEMICAL AND THERMAL RESPONSES FROM BUCCAL AND MAXILLARY NERVES IN THE MINNOW, *PSEUDORASBORA PARVA*. *Comp. Biochem. Physiol. A Comp. Physiol.* 69(2):187-195. 1981. SFA 26(3)
[S. Yamashita: Biol. Inst., Coll. Liberal Arts, Kagoshima Univ., Kagoshima 890, Japan]

PHYSIOLOGY (CONTINUED)

81-001885 Kime, D. E. and J. J. Rafter. BIOSYNTHESIS OF 15-HYDROXYLATED STEROIDS BY GONADS OF THE RIVER LAMPREY, *LAMPETRA FLUVIATILIS*, IN VITRO. *Gen. Comp. Endocrinol.* 44(1):69-76. May 1981. SFA 26(3)
[Dep. Zool., The University, Sheffield S10 2TN, England]

81-001886 Klovach, N. V. THE ENERGY METABOLISM OF THE BLACK SEA SILVERSIDE, *ATHERINA MOCHON PONTICA*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):141-144. 1980. SFA 26(3)
[VNIRO, Moscow, USSR]

81-001887 Konstantinov, A. S. COMPARATIVE EVALUATION OF THE INTENSITY OF RESPIRATION IN FISHES. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):98-104. 1980. SFA 26(3)
[Dep. Ichthyol., Moscow Univ., USSR]

81-001888 Kramer, D. L. and M. McClure. THE TRANSIT COST OF AERIAL RESPIRATION IN THE CATFISH *CORYDORAS AENEUS* (CALLICHTHYIDAE). *Physiol. Zool.* 54(2):189-194. Apr. 1981. SFA 26(3)
[Dep. Biol., McGill Univ., Montreal H3A 1B1, Canada]

81-001889 Kuz'mina, V. V. SEASONAL AND AGE-RELATED CHANGES IN α-AMYLASE ACTIVITY IN THE BREAM, *ABRAMIS BRAMA*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):105-110. 1980. SFA 26(3)
[Inst. Biol. Inland Waters, USSR Acad. Sci., Borok, Yaroslavl Reg., USSR]

81-001890 Kychanov, V. M. THE INFLUENCE OF PROTEIN METABOLISM ON THE RATE OF FERTILIZATION OF EGGS OF THE "CASPIAN INCONNU", *STENODUS LEUCICHTHYS*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(2):140-143. 1980. SFA 26(3)
[KaspNIRKk, Astrakhan, USSR]

81-001891 Lane, H. C.; A. E. Rolfe and J. R. Nelson. CHANGES IN THE NUCLEOTIDE TRIPHOSPHATE/HAEMOGLOBIN AND NUCLEOTIDE TRIPHOSPHATE/RED CELL RATIOS OF RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON, SUBJECTED TO PROLONGED STARVATION AND BLEEDING. *J. Fish Biol.* 18(6):661-668. June 1981. SFA 26(3)
[Wake Forest Univ., Winston-Salem, NC 27109]

81-001892 Leatherland, J. F. and R. A. Sonstegard. THYROID FUNCTION, PITUITARY STRUCTURE AND SERUM LIPIDS IN GREAT LAKES COHO SALMON, *ONCORHYNCHUS KISUTCH* WALBAUM, 'JACKS' COMPARED WITH SEXUALLY IMMATURE SPRING SALMON. *J. Fish Biol.* 18(6):643-653. June 1981. SFA 26(3)
[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON, Canada]

81-001893 Leaver, J. and J. R. Burt. PURIFICATION AND PROPERTIES OF PHOSPHOFRUCTOKINASE FROM COD (*GADUS MORHUA*) MUSCLE. *Comp. Biochem. Physiol. B Comp. Biochem.* 69(1):127-132. 1981. SFA 26(3)
[Microbiol. Chem. Res. Lab., The University, Newcastle upon Tyne NE1 7RU, England]

81-001894 Lessman, C. A. and C. W. Huver. QUANTIFICATION OF FERTILIZATION-INDUCED GAMETE CHANGES AND SPERM ENTRY WITHOUT EGG ACTIVATION IN A TELEOST EGG. *Dev. Biol.* 84(1):218-224. May 1981. SFA 26(3)

PHYSIOLOGY (CONTINUED)

81-001894 CONTINUED
[Dep. Popul. Dynamics, Div. Reprod. Biol., Johns Hopkins Univ., Baltimore, MD 21205]

81-001895 Matsuno, T. and H. Matsutaka. [CAROTENOIDS OF FOUR SPECIES OF CRUCIAN CARP AND TWO VARIETIES OF GOLDFISH.] *Bull. Jpn. Soc. Sci. Fish.* 47(1):85-88. Jan. 1981. In Japanese with English summ. SFA 26(3)
[Kyoto Coll. Pharm., Misasagi, Yamashina, Kyoto 607, Japan]

81-001896 McCormick, J. H. and J. A. Wegner. RESPONSES OF LARGEMOUTH BASS FROM DIFFERENT LATITUDES TO ELEVATED WATER TEMPERATURES. *Trans. Am. Fish. Soc.* 110(3):417-429. May 1981. SFA 26(3)
[U.S. EPA, 6201 Congdon Blvd., Duluth, MN 55804]

81-001897 Menasveta, P. LETHAL TEMPERATURE OF MARINE FISHES OF THE GULF OF THAILAND. *J. Fish Biol.* 18(5):603-607. May 1981. SFA 26(3)
[Dep. Mar. Sci., Fac. Sci., Chulalongkorn Univ., Bangkok, Thailand] Twenty-four marine fish species of the Gulf of Thailand were studied. The results suggested that increased acclimation temperature resulted in increased mean avoidance temperature (AT), critical thermal maximum (CTM) and upper incipient lethal temperature (UILT). At the acclimation temperature, which is normally the ambient seawater temperature of the Gulf of Thailand (28°C), the upper incipient lethal temperature ranged from 34°C to 37.5°C. *Monocanthus chinensis* and *Cynoglossus puncticeps* had the lowest thermal resistance, *Mugil dussumerii*, *Therapon theraps* and *Scatophagus argus* the highest and the rest in the middle range.

81-001898 Miller, N. W. THE EFFECT OF CAPTIVITY ON THE IMMUNE RESPONSE OF THE TELEOST, *FUNDULUS HETEROCLITUS*. *Ph.D. dissertation, Univ. Del.* 114p. 1981. From Diss. Abstr. Int. B Sci. Eng. 41(11):3982. May 1981. SFA 26(3)

81-001899 Moen, J. A.; A. R. Wisnes; E. A. Elsayed and E. E. Eliassen. THE EFFECT OF ADRENALINE ON PERIPHERAL VASCULAR RESISTANCE AT DIFFERENT TEMPERATURES IN A HIND PART PREPARATION OF RAINBOW TROUT (*SALMO GAIRDNERII* R.). *Comp. Biochem. Physiol. C Comp. Pharmacol.* 69(1):157-159. 1981. SFA 26(3)
[Dep. Biochem., Univ. Bergen, Årstadvein 19, N5000 Bergen, Norway]

81-001900 Monaco, P. J.; E. M. Rasch and J. S. Balsano. SPERM AVAILABLITY IN NATURALLY OCCURRING BISEXUAL-UNISEXUAL BREEDING COMPLEXES INVOLVING *POECILIA MEXICANA* AND THE GYNOGENETIC TELEOST, *POECILIA FORMOSA*. *Environ. Biol. Fishes* 6(2):159-166. 20 May 1981. SFA 26(3)
[Dep. Biophys., Coll. Med., East Tenn. State Univ., Johnson City 37601]

81-001901 Morley, M.; A. Chadwick and E. M. El Tounsy. THE EFFECT OF PROLACTIN ON WATER ABSORPTION BY THE INTESTINE OF THE TROUT (*SALMO GAIRDNERI*). *Gen. Comp. Endocrinol.* 44(1):64-68. May 1981. SFA 26(3)
[Dep. Forensic Med., St. James Hosp., Leeds LS9 9JT, England]

81-001902 Murata, H. [STUDIES ON 3:0 ACID FORMATION FROM 18:1ω9 ACID BY OXIDATION IN CARP DARK MUSCLE AND HEPATOPANCREAS MITOCHONDRIA.] *Bull. Jpn. Soc. Sci. Fish.* 47(1):79-83. Jan. 1981. In Japanese with English summ. SFA 26(3)
[Lab. Fish. Environ., Fac. Agric., Miyazaki Univ., Miyazaki 880, Japan]

PHYSIOLOGY (CONTINUED)

81-001903 Naftalin, R. J. and A. Kleinzeller. SUGAR ABSORPTION AND SECRETION BY WINTER FLOUNDER INTESTINE. *Am. J. Physiol.* 240(5):G392-G400. May 1981. SFA 26(3)
[Dep. Physiol., London Univ. King's Coll., Strand, London WC2R 2LS, England]

81-001904 Nelson, D. O. CHARACTERIZATION OF THERMOSENSITIVE PREOPTIC NEURONS IN THE GREEN SUNFISH, *LEPOMIS CYANELLUS*. *Ph.D. dissertation, Univ. Ill.* 122p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(11):4024. May 1981. SFA 26(3)

81-001905 Nemova, N. N.; V. S. Sidorov and P. O. Ripatti. LYSOSMAL DIGESTION OF ORGAN PROTEINS IN STARVED LAKE SALMON, *SALMO SALAR*, WHEN KEPT IN CONTAINERS DURING THE PRESPAWNING PERIOD. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):148-150. 1980. SFA 26(3)
[Biochem. Lab., Biol. Inst. Karelian Br. USSR Acad. Sci., Petrozavodsk, USSR]

81-001906 Neumann, D. A.; J. M. O'Connor and J. A. Sherk, Jr. OXYGEN COMSUMPTION OF WHITE PERCH (*MORONE AMERICANA*), STRIPED BASS (*M. SAXATILIS*) AND SPOT (*LEIOSTOMUS XANTHURUS*). *Comp. Biochem. Physiol. A Comp. Physiol.* 69(3):467-478. 1981. SFA 26(3)
[Aquatic Ecol. Assoc., Inc., 5100 Centre Ave., Pittsburgh, PA 15232] Oxygen consumption rates were determined for white perch swimming at 8.6 and 31.7 cm/sec (15°C), striped bass swimming at 8.6, 31.7, and 49 cm/sec (15 and 25°C), and spot swimming at the same three speeds (20°C). For each species, respiration rates increased as both weight and swimming speed increased. When oxygen consumption was considered in terms of relative activity (body lengths per second) spot were the most oxygen efficient and striped bass were the least efficient. These differences are discussed on the basis of the ecological characteristics of these three important estuarine fish.

81-001907 Nicoll, C. S.; S. W. Wilson; R. Nishioka and H. W. Bern. BLOOD AND PITUITARY PROLACTIN LEVELS IN TILAPIA (*SAROTHERODON MOSSAMBICUS*; TELEOSTEI) FROM DIFFERENT SALINITIES AS MEASURED BY A HOMOLOGOUS RADIOIMMUNOASSAY. *Gen. Comp. Endocrinol.* 44(3):365-373. July 1981. SFA 26(3)
[Dep. Physiol., Univ. Calif., Berkeley 94720]

81-001908 Nikinmaa, M. and A. Soivio. THE OXYGEN-BINDING PROPERTIES OF ERYTHROCYTE SUSPENSIONS OF *SALMO GAIRDNERI* AND OF HAEMOLYSATES IN VARIOUS BUFFERS IN THE PHYSIOLOGICAL pH RANGE. *Ann. Zool. Fenn.* 17(1):43-46. 1980. SFA 26(3)
[Dep. Zool., Div. Physiol., Univ. Helsinki, Arkadiankatu 7, SF-00100 Helsinki 10, Finland]

81-001909 Nilsson, S. ON THE ADRENERGIC SYSTEM OF GANOID FISH: THE FLORIDA SPOTTED GAR, *LEPISOSTEUS PLATYRHINCUS* (HOLOSTEI). *Acta Physiol. Scand.* 111(4):447-454. Apr. 1981. SFA 26(3)
[Dep. Zoophysiol., Univ. Göteborg, Box 250 59, S-400 31 Göteborg, Sweden]

PHYSIOLOGY (CONTINUED)

81-001910 Noaillac-Depeyre, J. and E. Hollande. EVIDENCE FOR SOMATOSTATIN, GASTRIN AND PANCREATIC POLYPEPTIDE-LIKE SUBSTANCES IN THE MUCOSA CELLS OF THE GUT IN FISHES WITH AND WITHOUT STOMACH. *Cell Tissue Res.* 216(1):193-203. Mar. 1981. SFA 26(3)
[Lab. Biol. Cell., Univ. Paul Sabatier, Toulouse, France]

81-001911 Onishi, T.; M. Suzuki and M. Takeuchi. [CHANGE IN CARP HEPATOPANCREATIC ENZYME ACTIVITIES WITH DIETARY PHOSPHORUS LEVELS.] *Bull. Jpn. Soc. Sci. Fish.* 47(3):353-357. Mar. 1981. In Japanese with English summ. SFA 26(3)
[Tokai Reg. Fish. Res. Lab., Kachidoki, Chuo-ku, Tokyo 104, Japan]

81-001912 Pang, P. K. T. HYPERCALCEMIC EFFECTS OF OVINE PROLACTIN ON INTACT KILLIFISH, *FUNDULUS HETEROCLITUS*, SUBJECTED TO DIFFERENT ENVIRONMENTAL CALCIUM CHALLENGES. *Gen. Comp. Endocrinol.* 44(2):252-255. June 1981. SFA 26(3)
[Dep. Pharmacol. Therapeutics, Tex. Tech Univ. Health Sci. Cent., Lubbock 79430]

81-001913 Payan, P.; N. Mayer-Gostan and P. K. T. Pang. SITE OF CALCIUM UPTAKE IN THE FRESH WATER TROUT GILL. *J. Exp. Zool.* 216(2):345-347. May 1981. SFA 26(3)
[Physiol. Cell. Comp., Univ. Nice Parc Valrose, 06034 Nice Cedex, France] Using the perfused head preparation, it is shown that in freshwater-adapted animals, the uptake of calcium takes place in the chloride cells.

81-001914 Pekkarinen, M. SEASONAL VARIATIONS IN LIPID CONTENT AND FATTY ACIDS IN THE LIVER, MUSCLE AND GONADS OF THE EEL-POUT, *ZOARCES VIVIPARUS* (TELEOSTEI) IN BRACKISH WATER. *Ann. Zool. Fenn.* 17(4):249-254. 1980. SFA 26(3)
[Dep. Zool., Univ. Helsinki, Arkadiankatu 7, SF-00100 Helsinki 10, Finland]

81-001915 Penney, R. K. and G. Goldspink. REGULATORY PROTEINS AND THERMOSTABILITY OF MYOFIBRILLAR ATPASE IN ACCLIMATED GOLDFISH. *Comp. Biochem. Physiol. B Comp. Biochem.* 69(3):577-583. 1981. SFA 26(3)
[Zool. Dep., The University, Hull, HU6 7RX, England]

81-001916 Penney, R. K. and G. Goldspink. SHORT TERM TEMPERATURE ACCLIMATION IN MYOFIBRILLAR ATPASE OF A STENOTHERM *SALMO GAIRDNERI* RICHARDSON AND AN EURYTHERM *CARASSIUS AURATUS*. *J. Fish Biol.* 18(6):715-721. June 1981. SFA 26(3)
[Zool. Dep., The University, Hull HU6 7RX England]

81-001917 Persson, L. THE EFFECTS OF TEMPERATURE AND MEAL SIZE ON THE RATE OF GASTRIC EVACUATION IN PERCH (*PERCA FLUVIATILIS*) FED ON FISH LARVAE. *Freshwater Biol.* 11(2):131-138. Apr. 1981. SFA 26(3)
[Inst. Limnol., Box 3060, S-220 03 Lund, Sweden] The rate of gastric evacuation in perch (*Perca fluviatilis*) (89-170 mm length) fed on fish larvae was studied at temperatures between 12.0 and 21.7°C. Gastric evacuation rates were usually described by an exponential function. The instantaneous rate of gastric evacuation (R) was constant for a large number of different meal sizes. At higher food rations, a lag phase in

PHYSIOLOGY (CONTINUED)

81-001917 CONTINUED digestion was found during the first part of digestion, and this ration size was smaller for smaller perch (89-110 mm) than for bigger perch (120-170 mm). Below these larger meal sizes, gastric evacuation was similar for the different size classes studied. The relation between *R* and temperature was described by an exponential function. The effects of meal size, number of food items, fish size and temperature on the rate of gastric evacuation are discussed.

81-001918 Petersen, I. M. PURIFICATION OF PHOSPHORYLASE B AND SOME PROPERTIES OF PHOSPHORYLASE A AND B FROM LIVER OF THE FLOUNDER (*PLATICHTHYS FLESUS* L.). *Comp. Biochem. Physiol. B Comp. Biochem.* 69(1):47-53. 1981. SFA 26(3)
[Inst. Biochem., Odense Univ., DK 5000, Odense, Denmark]

81-001919 Pic, P. and J. Maetz. ROLE OF EXTERNAL CALCIUM IN SODIUM AND CHLORIDE TRANSPORT IN THE GILLS OF SEAWATER-ADAPTED *MUGIL CAPITO*. *J. Comp. Physiol. B Biochem. Syst. Environ. Physiol.* 141(4):511-521. Mar. 1981. SFA 26(3)
[Lab. Histol., Fac. Med. Nord, Bd. Pierre Dramard, F-13326, Marseille Cedex 3, France]

81-001920 Pic, P. and P. Lahitette. EFFECTS OF CYTOCHALASIN B ON WATER, Na^+ and Cl^- EXCHANGES IN THE GILL OF SEAWATER ADAPTED MULLET *MUGIL CAPITO*. *J. Comp. Physiol. B Biochem. Syst. Environ. Physiol.* 141(4):523-529. Mar. 1981. SFA 26(3)
[Lab. Histol., Fac. Med. Nord, Bd. Pierre Dramard, F-13326 Marseille Cedex 3, France]

81-001921 Pic, P. and P. Lahitette. EFFECTS OF CYTOCHALASIN B ON WATER, Na+ and Cl- EXCHANGES IN THE GILL OF SEAWATER ADAPTED MULLET *MUGIL CAPITO*. *J. Comp. Physiol. B Biochem. Syst. Environ. Physiol.* 141(4):523-529. Mar. 1981. SFA 26(3)
[Lab. Histol., Fac. Med. Nord, Bd. Pierre Dramard, F-13326, Marseille Cedex 3, France]

81-001922 Pic, P. PHYSIOLOGIE ANIMALE. CONTRÔLE ADRÉNERGIQUE DE LA CONCENTRATION BRANCHIALE EN AMPC CHEZ *MUGIL CAPITO* ADAPTÉ À L'EAU DOUCE. [ADRENERGIC CONTROL OF THE BRANCHIAL cAMP LEVEL IN *MUGIL CAPITO* ADAPTED TO FRESH WATER.] *C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.* 292(14):863-866. 6 Apr. 1981. In French with English summ. SFA 26(3)
[Lab. Histol., Fac. Med.-Nord, Boulevard P.-Drummard, 13326 Marseille Cedex 3, France]

81-001923 Pieterse, J. J.; G. L. Smit; K. Van Vliet, H. J. Schoonbee and J. Hattingh. OBSERVATIONS ON THE BLOOD OF THE CHINESE SILVER CARP *HYPOPHTHALMICHTHYS MOLITRIX* (VALENCIENNES). *J. Fish Biol.* 18(4):455-459. Apr. 1981. SFA 26(3)
[Dep. Biol. Sci., Technikon Pretoria, Pretoria 0001, South Africa]

81-001924 Plisetskaya, E. M.; L. P. Soltitskaya and G. I. Flerova. THE CONTENT OF SOME METABOLITES AND HORMONES IN THE BLOOD SERUM OF THE BREAM, *ABRAMIS BRAMA*, OF TWO AGE GROUPS. *J. Ichthyol. (Engl. Transl. Vopr.*

PHYSIOLOGY (CONTINUED)

81-001924 CONTINUED *Ikhtiol.)* 20(2):150-153. 1980. SFA 26(3)
[Inst. Evol. Physiol. Biochem., USSR Acad. Sci., Leningrad, USSR]

81-001925 Porthe-Nibelle, J. and B. Lahlou. MECHANISMS OF GLUCOCORTICOID UPTAKE BY ISOLATED HEPATOCYTES OF THE TROUT. *Comp. Biochem. Physiol. B Comp. Biochem.* 69(3):425-433. 1981. SFA 26(3)
[Lab. Physiol. Comp., Fac. Sci. Tech., Univ. Nice, Parc Valrose, 06034 Nice Cedex, France]

81-001926 Roales, R. R. THE EFFECT OF GROWTH INHIBITING FACTORS ON THE TOTAL LIPID CONTENT OF THE ZEBRAFISH, *BRACHYDANIO RERIO* (HAMILTON-BUCHANAN). *J. Fish Biol.* 18(6):723-728. June 1981. SFA 26(3)
[Dep. Anat. Physiol., Div. Biol. Phys. Sci., Indiana Univ., 2300 S. Washington St., Kokomo 46901] The effects of growth inhibiting factors on the total lipid content of zebrafish was studied. Crowded zebrafish were subjected to extraction of the aquarium water using activated charcoal. Control fish were crowded, but were not subjected to extraction. This resulted in a gain in mean wet weight of 10.9% for the crowded, extracted fish (experimentals) as compared to the controls. In order to determine the effects of crowding on the total lipid content of the crowded fish, lipid analyses were conducted at the conclusion of the growth studies. These studies indicate that the fish in the extracted system had a greater lipid content than those in the non-extracted system (15.4% v. 10.4% mean lipid). It is proposed that growth inhibiting factors liberated from the crowded fish may affect the thyroid gland, causing lipid mobilization from the tissues resulting in lowered total lipid in these animals. Extraction of the aquarium water with activated charcoal removes the growth inhibiting factor, possibly decreasing thyroid function with a resulting higher total lipid content.

81-001927 Sakaguchi, H. and A. Hamaguchi. [EFFECT OF TEMPERATURE ON THE CHEMICAL CONSTITUTENTS IN SERUM, HEPATOPANCREAS AND OTHER VISCERA OF CULTURED RED SEA BREAM DURING STARVATION.] *Bull. Jpn. Soc. Sci. Fish.* 47(1):27-33. Jan. 1981. In Japanese with English summ. SFA 26(3)
[Fac. Fish., Nagasaki Univ., Nagasaki 852, Japan]

81-001928 Sakata, T.; H. Sugita; T. Mitsuoka; D. Kakimoto and H. Kadota. CHARACTERISTICS OF OBLIGATE ANEROBIC BACTERIA IN THE INTESTINES OF FRESHWATER FISH. *Bull. Jpn. Soc. Sci. Fish.* 47(3):421-427. Mar. 1981. SFA 26(3)
[Fac. Fish., Kagoshima Univ., Kagoshima 890, Japan]

81-001929 Sand, O. KINETIC PROPERTIES OF PHOSPHOFRUCTOKINASE FROM THE FLOUNDER (*PLATICHTYS FLESUS* L.). *Comp. Biochem. Physiol. B Comp. Biochem.* 69(3):435-443. 1981. SFA 26(3)
[Inst. Biochem., Odense Univ. Campusvej 55, 5230 Odense M. Denmark]

81-001930 Satunovskij, M. I. SOME ASPECTS OF APPLICATION OF PHYSIOLOGICAL ECOLOGY TO ICHTHYOLOGY. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 133-135. 1981. SFA 26(3)
[A.N. Severcov Inst. Evol. Anim. Morphol. Ecol., USSR Acad. Sci., Moscow, USSR]

PHYSIOLOGY (CONTINUED)

81-001931 Scott, A. L. and W. A. Rogers. HAEMATOLOGICAL EFFECTS OF PROLONGED SUBLETHAL HYPOXIA ON CHANNEL CATFISH *ICTALURUS PUNCTATUS* (RAFINESQUE). *J. Fish Biol.* 18(5):591-601. May 1981. SFA 26(3)

[Agric. Exp. Stn., Auburn Univ., Auburn, AL 36830] Sub-adult channnel catfish, *Ictalurus punctatus*, were exposed to sublethal hypoxia for 24, 48 or 72 h. Haematological parameters were used to assess the physiological state of the catfish subjected to prolonged, sublethal hypoxia. Haemoglobin, mean corpuscular haemoglobin, mean corpuscular haemoglobin concentration, plasma lactic acid and plasma glucose deviated significantly from control values in channel catfish exposed to hypoxia for 24, 48 or 72 h. Haematocrit, total plasma protein, total erythrocyte counts, total leukocyte counts, mean corpuscular volume and differential leukocyte counts were not sensitive indicators of the catfish's physiological status. After five days of reacclimation to oxygen levels near saturation, channel catfish continued to exhibit haematological responses to prolonged hypoxia.

81-001932 Shelton, W. L.; D. Rodriguez-Guerrero and J. Lopez-Macias. FACTORS AFFECTING ANDROGEN SEX REVERSAL OF *TILAPIA AUREA*. *Aquaculture* 25(1):59-65. July 1981. SFA 26(3)

[Ala. Coop. Fish. Res. Unit, Auburn Univ., Auburn, AL 36849] *Tilapia aurea* were fed a single level of androgen-treated feed (ethynyltestosterone at 60 mg/kg of feed - ET-60) under a variety of conditions to determine the effect on sex reversal. Sex ratios were significantly altered in favor of males in 16- and 19-day treatments at 21 and 30°C; all-male populations were produced in 21- and 28-days at 21°C, but a few females persisted in the groups at 30°C. Feeding regimes of 12% body weight/day and satiation had variable impacts on growth but did not adversely affect success of sex reversal, except at higher temperatures. Because of higher metabolic rate at 30°C and the concomitant increase in appetite, a fixed level of feeding at 12% of body weight was considered to be limiting and was later increased to 15%. High stocking density (2600 fry/m^2 of surface) reduced growth rate but did not affect sex reversal. A 21-day treatment with ET-60 fed at 15% body weight/day at water temperatures between 21 and 30°C should consistently produce all-male populations of *T. aurea* at stocking densities up to 2600 fry/m^2.

81-001933 Shimeno, S.; H. Hosokawa,; M. Takeda; S. Takayama; A. Fukui and H. Sasaki. [ADAPTATION OF HEPATIC ENZYMES TO DIETARY LIPID IN YOUNG YELLOWTAIL.] *Bull. Jpn. Soc. Sci. Fish.* 47(1):63-69. Jan. 1981. In Japanese with English summ. SFA 26(3)

[Fac. Agric., Kochi Univ., Nankoku 783, Japan]

81-001934 Shimeno, S.; M. Takeda and H. Sasaki. [RESPONSE OF NITROGEN EXCRETION TO CHANGE OF DIETARY COMPOSITION IN CARP.] *Bull. Jpn. Soc. Sci. Fish.* 47(2):191-195. Feb. 1981. In Japanese with English summ. SFA 26(3)

[Fac. Agric., Kochi Univ., Nankoku 783, Japan]

81-001935 Shimeno, S.; M. Takeda; S. Takayama; A. Fukui; H. Sasaki and H. Kajiyama. [ADAPTATION OF HEPATOPANCREATIC ENZYMES TO DIETARY CARBOHYDRATE IN CARP.] *Bull. Jpn. Soc. Sci. Fish.* 47(1):71-77. Jan. 1981. In Japanese with English summ. SFA 26(3)

[Fac. Agric., Kochi Univ., Nankoku 783, Japan]

81-001936 Shimma, Y.; K. Ikeda and H. Shimma. [PLASMA CONSTITUENTS OF MATURED RAINBOW TROUT RAISED WITH FISH MEAL AND SCP COMBINED FEEDS.] *Bull. Jpn. Soc. Sci. Fish.* 47(3):371-376. Mar. 1981. In Japanese with English

PHYSIOLOGY (CONTINUED)

81-001936 CONTINUED summ. SFA 26(3)
[Natl. Res. Inst. Aquacult., Tamakicho, Mie 519-04, Japan]

81-001937 Snyder, G. R. EFFECTS OF STARVATION ON PRESMOLT COHO SALMON (*ONCORHYNCHUS KISUTCH*). *Ph. D. dissertation, Univ. Idaho* 143p. 1980. From Diss. Abstr. Int. B Sci. 41(11):3948. May 1981. SFA 26(3)

81-001938 Sørensen, P. G. SOME PROPERTIES OF THE $Na^+ + K^+$-LINKED Mg^{2+}-DEPENDENT ADENOSINE TRIPHOSPHATASE FROM THE ERYTHROCYTE PLASMA MEMBRANE OF THE FLOUNDER (*PLATICHTHYS FLESUS* L.). *Comp. Biochem. Physiol. C Comp. Pharmacol.* 69(1):45-52. 1981. SFA 26(3)
[Inst. Biochem., Odense Univ., Campusvej 55, 5230 Odense M, Denmark]

81-001939 Spieler, R. E. and T. A. Noeske. TIMING OF A SINGLE DAILY MEAL AND DIET VARIATIONS OF SERUM THYROXINE, TRIIODOTHYRONINE AND CORTISOL IN GOLDFISH *CARASSIUS AURATUS*. *Life Sci.* 28(26):2939-2944. 29 June 1981. SFA 26(3)
[Vert. Div., Milwaukee Publ. Mus., 800 W. Wells, Milwaukee, WI 53233]

81-001940 Sufi, G. B.; K. Mori and R. Sato. HISTOCHEMICAL CHANGES IN ACTIVITIES OF DEHYDROGENASES RELATED TO STEROIDOGENESIS IN SALMONID FISHES (GENUS *ONCORHYNCHUS*) DURING SEXUAL MATURATION AND SPAWNING. *Tohoku J. Agric. Res.* 31(2):74-96. Oct. 1980. SFA 26(3)
[Dep. Zool., Dacca Univ., Dacca-2, Bangladesh]

81-001941 Sufi, G. B.; K. Mori and T. Nomura. INVOLUTION OF THYMUS IN RELATION TO SEXUAL MATURITY AND STERIOD HORMONE TREATMENTS IN SALMONID FISH. *Tohoku J. Agric. Res.* 31(2):97-105. Oct. 1980. SFA 26(3)
[Dep. Zool., Dacca Univ., Dacca-2, Bangladesh]

81-001942 Suzuki, Y. and T. Hibiya. [EFFECT OF INCREASED VASCULAR PERMEABILITY ON TISSUE FLUID PROTEIN COMPOSITION IN INFLAMMATION OF FISH.] *Bull. Jpn. Soc. Sci. Fish.* 47(3):329-331. Mar. 1981. In Japanese with English summ. SFA 26(3)
[Lab. Fish Physiol., Fac. Agric., Univ. Tokyo, Bunkyo-ku, Tokyo 113, Japan]

81-001943 Suzuki, Y. and T. Hibiya. [MORPHOLOGICAL CHANGES AND INCREASED PERMEABILITY OF BLOOK VESSELS IN ACUTE INFLAMMATION OF FISH.] *Bull. Jpn. Soc. Sci. Fish.* 47(3):323-327. Mar. 1981. In Japanese with English summ. SFA 26(3)
[Lab. Fish Physiol., Fac. Agric., Univ. Tokyo, Bunkyo-ku, Tokyo 113, Japan]

81-001944 Suzuki, Y.; R. Nakamura; M. Nakahara and T. Ueda. BINDING OF RADIONUCLIDES TO PROTEINS IN FISH. *Bull. Jpn. Soc. Sci. Fish.* 47(2):261-265. Feb. 1981. SFA 26(3)
[Div. Mar. Radioecol., Natl. Inst. Radiol. Sci., Nakaminato, Ibaraki 311-12, Japan]

PHYSIOLOGY (CONTINUED)

81-001945 Sytina, L. A. REACTION OF ACIPENSERID EMBRYOS AND LARVAE TO CHANGES OF TEMPERATURE DURING EGG INCUBATION. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 129-132. 1981. SFA 26(3)
[A.N. Severcov Inst. Evol. Anim. Morphol. Ecol., USSR Acad. Sci., Moscow, USSR]

81-001946 Takeuchi, M. and J. Nakazoe. [EFFECT OF DIETARY PHOSPHORUS ON LIPID CONTENT AND ITS COMPOSITION IN CARP.] *Bull. Jpn. Soc. Sci. Fish.* 47(3):347-352. Mar. 1981. In Japanese with English summ. SFA 26(3)
[Tokai Reg. Fish Res. Lab., Kachidoki-5, Chuo-ku, Tokyo 104, Japan]

81-001947 Tamaru, C. S. ONTOGENY OF LACTATE DEHYDROGENASE IN DEVELOPING CARP EMBRYOS. *Pac. Sci.* 34(3):338-339. July 1980. Abstract only. SFA 26(3)
[Dep. Zool., Univ. Hawaii, Honolulu 96822]

81-001948 Tandler, A. and F. W. H. Beamish. APPARENT SPECIFIC DYNAMIC ACTION (SDA), FISH WEIGHT AND LEVEL OF CALORIC INTAKE IN LARGEMOUTH BASS, *MICROPTERUS SALMOIDES* LACEPEDE. *Aquaculture* 23(1-4):231-242. Apr. 1981. SFA 26(3)
[Maricult. Lab., Isr. Oceanogr. Limnol. Res., P.O. Box 1212, Elat, Israel] Apparent SDA (specific dynamic action) in largemouth bass (*Micropterus salmoides*) was equated to the oxygen uptake associated with a meal of a dry pelleted diet (35.8% protein). Apparent SDA, maximum rate of oxygen uptake, and the length of time that the rate of oxygen uptake remained elevated above the prefeeding level was measured in relation to energy ingested (5-150 cal/g) and fish weight (5-250 g). Apparent SDA was positively related to energy intake, but for a given energy intake it was negatively related to bass weight. When expressed relative to energy intake, the mean apparent SDA of the dry pelleted diet represented 11.3% ± 1.32 (95% limits). Maximum oxygen uptake following a meal was positively related to energy ingested and to fish weight. In bass smaller than 100 g and fed to satiation, oxygen uptake equalled the active rate. The length of time (12 to 76 h) that the rate of oxygen uptake remained elevated was positively related to energy ingested and negatively related to bass weight. The observations in the present study are discussed with reference to natural diets and to other studies where growth and food conversion efficiency were measured.

81-001949 Teeter, J. H. and M. V. L. Bennett. SYNAPTIC TRANSMISSION IN THE AMPULLARY ELECTRORECEPTOR OF THE TRANSPARENT CATFISH, *KRYPTOPTERUS*. *J. Comp. Physiol. A Sens. Neural Behav. Physiol.* 142(3):371-377. May 1981. SFA 26(3)
[Monell Chem. Sens. Cent., Philadelphia, PA 19104]

81-001950 Theofan, G. and F. W. Goetz. THE *IN VITRO* EFFECTS OF ACTINOMYCIN D AND CYCLOHEXIMIDE ON GERMINAL VESICLE BREAKDOWN AND OVULATION OF YELLOW PERCH (*PERCA FLAVESCENS*) OOCYTES. *Comp. Biochem. Physiol. A Comp. Physiol.* 69(3):557-561. 1981. SFA 26(3)
[Dep. Biol., Univ. Notre Dame, Notre Dame, IN 46556]

81-001951 Tilley, P. A. G.; T. A. Watson and B. A. McKeown. THE ABSENCE OF ACETYLCHOLINESTERASE IN VARIOUS BLOOD PREPARATIONS OF RAINBOW TROUT, *SALMO GAIRDNERI*. *Comp. Biochem. Physiol. C Comp. Pharmacol.* 69(1):125-127. 1981. SFA 26(3)
[Dep. Biol. Sci., Simon Fraser Univ., Burnaby, BC, V5A 1S6, Canada]

PHYSIOLOGY (CONTINUED)

81-001952 Tomasso, J. R.; K. B. Davis and N. C. Parker. PLASMA CORTICOSTEROID DYNAMICS IN CHANNEL CATFISH, *ICTALURUS PUNCTATUS* (RAFINESQUE), DURING AND AFTER OXYGEN DEPLETION. *J. Fish Biol.* 18(5):519-526. May 1981. SFA 26(3)
[Ecol. Res. Cent., Dep. Biol., Memphis State Univ., Memphis, TN 38152] Plasma corticosteroid concentrations in channel catfish, *Ictalurus punctatus*, (normally 1.0 ± 0.3µg/100 ml) increased significantly (to 5.9 ± 1.2µg/100 ml) in response to acute oxygen depletion and then returned to control levels within 30 min after the dissolved oyxgen concentration was increased; however, a secondary increase in plasma corticosteroid levels was observed 6 h after exposure. Corticosteroid levels also increased in fish exposed to dissolved oxygen concentration of <0.2 mg/l for three days. Methylene blue was not effective in preventing interrenal response to low dissolved oxygen. No diurnal plasma corticosteroid rhythm was observed in fish exposed to diurnal chemical rhythms of culture ponds.

81-001953 Ueno, R.; T. Morishita and T. Takahashi. [INTRACELLULAR DISTRIBUTION OF ENZYMES AND PARTICLE PROPERTIES OF LYSOSOMES IN CARP MUSCLE TISSUE.] *Bull. Jpn. Soc. Sci. Fish.* 47(2):207-214. Feb. 1981. In Japanese with English summ. SFA 26(3)
[Fac. Fish., Mie Univ., Tsu, Mie 154, Japan]

81-001954 Ultsch, G. R.; D. C. Jackson and R. Moalli. METABOLIC OXYGEN CONFORMITY AMONG LOWER VERTEBRATES: THE TOADFISH REVISITED. *J. Comp. Physiol. B Biochem. Syst. Environ. Physiol.* 142(4):439-443. 11 May 1981. SFA 26(3)
[Dep. Biol., Univ. Ala., Tuscaloosa 35486]

81-001955 Uskova, Ye. T.; A. V. Chaykovskaya and S. I. Davidenko. ON THE CHEMICAL NATURE OF THE SKIN MUCOSA IN THE MULLET, *MUGIL AURATUS*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(2):112-118. 1980. SFA 26(3)
[Inst. Zool., Ukrainian SSR Acad. Sci., Kiev, USSR]

81-001956 van Bohemen, C. G.; J. G. D. Lambert and J. Peute. ANNUAL CHANGES IN PLASMA AND LIVER IN RELATION TO VITELLOGENESIS IN THE FEMALE RAINBOW TROUT, *SALMO GAIRDNERI*. *Gen. Comp. Endocrinol.* 44(1):94-107. May 1981. SFA 26(3)
[J. G. D. Lambert: Zool. Lab., Sect. Comp. Endocrinol., State Univ. Utrecht, 8 Padualaan, 3508 TB Utrecht, The Netherlands]

81-001957 van Eys, G. J. J. M. and P. T. W. Peters. EVIDENCE FOR A DIRECT ROLE OF α-MSH IN MORPHOLOGICAL BACKGROUND ADAPTATION OF THE SKIN IN *SAROTHERODON MOSSAMBICUS*. *Cell Tissue Res.* 217(2):361-372. May 1981. SFA 26(3)
[Dep. Zool., Univ. Nijmegen, 6525 ED Nijmegen, The Netherlands]

81-001958 van Waarde, A. and F. Kesbeke. REGULATORY PROPERTIES OF AMP-DEAMINASE FROM LATERAL RED MUSCLE AND DORSAL WHITE MUSCLE OF GOLDFISH, *CARASSIUS AURATUS* (L.). *Comp. Biochem. Physiol. B Comp. Biochem.* 69(3):413-423. 1981. SFA 26(3)
[Dep. Anim. Physiol., Zool. Lab., State Univ. Leiden, P.O. Box 9516, 2300 RA Leiden, The Netherlands]

PHYSIOLOGY (CONTINUED)

81-001959 Volodin, V. M. THE EFFECT OF TEMPERATURE ON RESORPTION IN PRACTICALLY MATURE EGGS AND THE DEVELOPMENT OF THE NEXT GENERATION OF OOCYTES IN THE BLUE BREAM, *ABRAMIS BALLERUS*, FROM RYBINSK RESERVOIR. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):56-61. 1980. SFA 26(3)
[Inst. Biol. Inland Waters, USSR Acad. Sci., Borok, Yaroslavl Prov., USSR] Data are given on an experimental study of the resorption process in nearly mature eggs of the blue bream, *Abramis ballerus*, in ponds with differing water temperatures. It is shown that temperature has a considerable effect on the rate of egg resorption and on the development of the next generation of oocytes.

81-001960 Wilhelm F., D. and E. Reischl. HETEROGENEITY AND FUNCTIONAL PROPERTIES OF HEMOGLOBINS FROM SOUTH BRAZILIAN FRESHWATER FISH. *Comp. Biochem. Physiol. B Comp. Biochem.* 69(3):463-470. 1981. SFA 26(3)
[E. Reischl: Inst. Biocienc., Univ. Fed. Rio Grande, Sul, Caixa Postal, 1953, 90.000, Porto Alegre, RS, Brazil]

81-001961 Wilkes, P. R. H.; R. L. Walker; D. G. McDonald and C. M. Wood. RESPIRATORY, VENTILATORY, ACID-BASE AND IONOREGULATORY PHYSIOLOGY OF THE WHITE SUCKER *CATOSTOMUS COMMERSONI*: THE INFLUENCE OF HYPEROXIA. *J. Exp. Biol.* 91:239-254. Apr. 1981. SFA 26(3)
[Dep. Biol., Univ. Calgary, Calgary, AB T2N 1N4, Canada]

81-001962 Winberg, M.; S. Holmgren and S. Nilsson. EFFECTS OF DENERVATION AND 6-HYDROXYDOPAMINE ON THE ACTIVITY OF CHOLINE ACETYLTRANSFERASE IN THE SPLEEN OF THE COD, *GADUS MORHUA*. *Comp. Biochem. Physiol. C Comp. Pharmacol.* 69(1):141-143. 1981. SFA 26(3)
[Dep. Zoophysiol., Univ. Göteborg, Box 250 59, S-400 31 Göteborg, Sweden]

81-001963 Woo, N. Y. S. and A. C. Y. Fung. STUDIES ON THE BIOLOGY OF THE RED SEA BREAM, *CHRYSOPHRYS MAJOR*--II. SALINITY ADAPTATION. *Comp. Biochem. Physiol. A Comp. Physiol.* 69(2):237-242. 1981. SFA 26(3)
[Dep. Biol., Chinese Univ. Hong Kong, Shatin, Hong Kong]

81-001964 Woo, N. Y. S. and A. C. Y. Fung. STUDIES ON THE BIOLOGY OF THE RED SEA BREAM *CHRYSOPHRYS MAJOR*--IV. METABOLIC EFFECTS OF STARVATION AT LOW TEMPERATURE. *Comp. Biochem. Physiol. A Comp. Physiol.* 69(3):461-465. 1981. SFA 26(3)
[Dep. Biol., Chinese Univ., Hong Kong, Shaten, Hong Kong]

81-001965 Wyban, J. YOLK UTILIZATION IN TELEOST DEVELOPMENT. *Pac. Sci.* 34(3):343. July 1980. Abstract only. SFA 26(3)
[Dep. Zool., Univ. Hawaii, Honolulu 96822]

81-001966 Yanda, D. M. and J. G. Ghazarian. VITAMIN D AND 25-HYDROXYVITAMIN D IN RAINBOW TROUT (*SALMO GAIRDNERI*): CYTOCHROME P-450 AND BIOTRANSFORMATIONS OF THE VITAMINS. *Comp. Biochem. Physiol. B Comp. Biochem.* 69(2):183-188. 1981. SFA 26(3)
[Dep. Biochem., Med. Coll. Wis., Milwaukee 53226]

PHYSIOLOGY (CONTINUED)

81-001967 Zhirnova, A. A. and M. L. Krykhtin. THE DIURNAL PERIODICITY OF CELL DIVISION IN THE EPITHELIAL TISSUES OF LARVAE OF THE AMUR AUTUMN CHUM SALMON, *ONCORHYNCHUS KETA*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):145-147. 1980. SFA 26(3)
[AoTINRO, Khabarovsk, USSR]

GENETICS, VARIATION STUDIES AND HYBRIDIZATION

81-001968 Beland, K. F.; F. L. Roberts and R. L. Saunders. EVIDENCE OF *SALMO SALAR X SALMO TRUTTA* HYBRIDIZATION IN A NORTH AMERICAN RIVER. *Can. J. Fish. Aquatic Sci.* 38(5):552-554. May 1981. In English with French summ. SFA 26(3)
[Me. Atl. Sea Run Salmon Comm., Water St., Machias 04654]

81-001969 Bhowmick, R. M.; R. K. Jana; S. D. Gupta; G. V. Kowtal and M. Rout. STUDIES ON SOME ASPECTS OF BIOLOGY AND MORPHOMETRY OF THE INTERGENERIC HYBRID, *CATLA CATLA* HAMILTON X *LABEO ROHITA* HAMILTON PRODUCED BY HYPOPHYSATION. *Aquaculture* 23(1-4):367-371. Apr. 1981. SFA 26(3)
[Cent. Inland Fish. Res. Stn., Cuttock, Orissa, India] A catla-rohu hybrid produced by hypophysation was found to intermediate in general appearance to the parent species. Gut content analysis revealed that the hybrid was mainly phytophagous in its diet. Growth rate was observed to be faster than in rohu. It matured within 3 years and was equally responsive to hypophysation. Comparison of selected morphometric measurements of parents and progeny was made and the results are presented in this paper.

81-001970 Brody, T.; G. Wohlfarth; G. Hulata and R. Moav. APPLICATION OF ELECTROPHORETIC GENETIC MARKERS TO FISH BREEDING IV. ASSESSMENT OF BREEDING VALUE OF FULL-SIB FAMILIES. *Aquaculture* 24(1-2):175-186. May 1981. SFA 26(3)
[Dep. Genet., Hebrew Univ., Jerusalem, Israel]

81-001971 Echelle, A. A. and D. T. Mosier. ALL-FEMALE FISH: A CRYPTIC SPECIES OF *MENIDIA* (ATHERINIDAE). *Science* 212(4501):1411-1413. 19 June 1981. SFA 26(3)
[Biol. Sci., Okla. State Univ., Stillwater 74078] Electrophoretic evidence revealed the common occurrence of an all-female species of *Menidia* (Pisces: Atherinidae) at two localities separated by 280 kilometers on the Gulf Coast of Texas. This finding adds significantly to the known taxonomic spectrum of unisexuality in fishes and demonstrates that unisexually may be more common among fishes that do not bear live young than is generally suspected.

81-001972 Fairbairn, D. J. BIOCHEMICAL GENETIC ANALYSIS OF POPULATION DIFFERENTIATION IN GREENLAND HALIBUT (*REINHARDTIUS HIPPOGLOSSOIDES*) FROM THE NORTHWEST ATLANTIC, GULF OF ST. LAWRENCE, AND BERING SEA. *Can. J. Fish. Aquatic Sci.* 38(6):669-677. June 1981. In English with French summ. SFA 26(3)
[104 Westcliffe Ave., Pointe Claire, PQ H9R 1M6, Canada]

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

81-001973 Ferguson, A. and F. M. Mason. ALLOZYME EVIDENCE FOR REPRODUCTIVELY ISOLATED SYMPATRIC POPULATIONS OF BROWN TROUT *SALMO TRUTTA* L. IN LOUGH MELVIN, IRELAND. *J. Fish Biol.* 18(6):629-642. June 1981. SFA 26(3)

[Dep. Zool., Queen's Univ., Belfast, Northern Ireland] Electrophoretic studies of five polymorphic enzyme loci (*G-3-PDH-2, LDH-1, LDH-5, PGI-2, PGI-3*) in brown trout from Lough Melvin in northwestern Ireland have demonstrated that the morphotypes known by the vernacular names of 'ferox', 'gillaroo' and 'sonaghen', are not merely ecophenotypes but represent genetically distinct and reproductively isolated populations. The results suggest that the long life and higher growth potential of ferox trout of this lake, and possibly others, has a genetic basis. These separate demes of brown trout are probably the result of multiple invasions in post-glacial times of allopatrically derived stocks. Lough Melvin's isolated position and absence of pike, *Esox lucius*, and large cyprinids have probably contributed to its pristine condition. As such it is one of the few remaining examples of what may once have been a widespread situation in Britain and Ireland.

81-001974 Fujino, K.; K. Sasaki and S. Okumura. GENETIC DIVERSITY OF SKIPJACK TUNA IN THE ATLANTIC, INDIAN AND PACIFIC OCEANS. *Bull. Jpn. Soc. Sci. Fish* 47(2):215-222. Feb. 1981. SFA 26(3)

[Kitasato Univ. Sch. Fish. Sci., Sanriku, Iwate 022-01, Japan]

81-001975 Gunnes, K. and T. Gjedrem. A GENETIC ANALYSIS OF BODY WEIGHT AND LENGTH IN RAINBOW TROUT REARED IN SEAWATER FOR 18 MONTHS. *Aquaculture* 24(1-2):161-174. May 1981. SFA 26(3)

[Dep. Anim. Genet. Breeding, Agric. Univ. Norway, 1432 Ås-NLH, Norway] Data from four year-classes of rainbow trout was analysed. The brood fish originally came from different Norwegian fish farms, but all are considered to belong to the same population. During the freshwater period each full-sib family was reared separately and each group was given as equal environmental conditions as possible. Fingerlings from each full-sib family were sampled and freeze-branded. At an age of one year fingerlings from each family were sampled and transported to different fish farms along the Norwegian coast. This paper deals with the traits body weight and length at slaughter after about 18 months in net cages in the sea. Fish farm X sire interaction was significant, but accounted for a relatively small part of the total phenotypic variance. It is concluded that genotype X farm interaction can be ignored when planning a selection programme for rainbow trout under Norwegian farming conditions. A significant interaction was found between sire and dam, implying the presence of non-additive genetic variation. The heritabilities for body weight and length estimated from sire components (year-class 1973, 1974 and 1975) were 0.17 and 0.23, respectively. The genetic correlation between body weight and length was close to unity. Genetic variation in body weight of rainbow trout is high, about three times as high as for body length. The heritabilities estimated for condition factor were small and none of the sire components were significant. It is concluded that the combination of weight and length used to calculate the *K*-factor has little genetic basis.

81-001976 Jørstad, K. E.; J. Reisegg and O. R. Godø. GENETISK ANALYSE AV MERKET TORSK (*GADUS MORHUA* L.). [GENETIC ANALYSIS OF TAGGED COD (*GADUS MORHUA* L.).] *Fisken Havet* 1981(2):1-16. 1981. In Norwegian with English summ. SFA 26(3)

[Fiskeridir. Havforskningsinst., Bergen, Norway]

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

81-001977 Jørstad, K. E.; O. R. Godø; E. Moksness and J. Reisegg. KRYSNINGSFORSØK MELLOM SKREI OG KYSTTORSK. [CROSSING EXPERIMENTS BETWEEN ARCTIC AND COASTAL COD.] *Fisken Havet* 1981(2):17-30. 1981. In Norwegian with English summ. SFA 26(3)
[Fiskeridir. Havforskningsinst., Bergen, Norway]

81-001978 Kozlov, V. I. A RARE NATURAL HYBRID OF THE ROACH, *RUTILUS RUTILUS HECKELI*, AND THE CHUB, *LEUCISCUS CEPHALUS*, FROM THE LOWER DNIEPER. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):126-130. 1980. SFA 26(3)
[Krasnodarsk Br., All-Union Pond Fish. Res. Inst., USSR]

81-001979 Krylova, V. D. VARIABILITY AND INHERITANCE OF CHARACTERS IN F_1 AND F_2 HYBRIDS OF THE BELUGA, *HUSO HUSO*, X STERLET, *ACIPENSER RUTHENUS*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(2):35-48. 1980. SFA 26(3)
[VNIRO, Moscow, USSR]

81-001980 Moyle, P. B. and M. Massingill. HYBRIDIZATION BETWEEN HITCH, *LAVINIA EXILICAUDA* AND SACRAMENTO BLACKFISH, *ORTHODON MICROLEPIDOTUS*, IN SAN LUIS RESERVOIR, CALIFORNIA. *Calif. Fish Game* 67(3):196-198. July 1981. SFA 26(3)
[Dep. Wildl. Fish. Biol., Univ. Calif., Davis 95616]

81-001981 Ojima, Y. and T. Yamano. THE ASSIGNMENT OF THE NUCLEOLAR ORGANIZER IN THE CHROMOSOMES OF THE FUNA (*CARASSIUS*, CYPRINIDAE, PISCES). *Proc. Jpn. Acad. Ser. B Phys. Biol. Sci.* 56(9):551-556. Nov. 1980. SFA 26(3)
[Dep. Biol., Fac. Sci., Kwansei Gakuin Univ., Nishinomiya, Japan]

81-001982 Pervozvansky, V. Ya. and Yu. P. Zelinsky. [MORPHOLOGICAL AND KARYOLOGICAL PECULIARITIES OF THE ROACH (*RUTILUS RUTILUS*) AND BREAM (*ABRAMIS BRAMA*) HYBRIDS IN LOSOSINNOYE LAKE.] *Zool. Zh.* 60(3):388-397. Mar. 1981. In Russian with English summ. SFA 26(3)
[Inst. Biol., Karelia Subdiv. USSR Acad. Sci., Petrozavodsk, USSR]

81-001983 Ráb, P. KARYOTYPES OF TWO AFRICAN BARBELS *BARBUS BARILOIDES* AND *BARBUS HOLOTAENIA*. *Folia Zool.* 30(2):181-190. 1981. SFA 26(3)
[Inst. Anim. Physiol. Genet., Czech. Acad. Sci., Liběchov, Czechoslovakia]

81-001984 Ráb, P. EVOLUTIONARY POLYPLOIDY OF FISHES. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 107-111. 1981. SFA 26(3)
[Inst. Anim. Physiol. Genet., Czech. Acad. Sci., Liběchov, Czechoslovakia]

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

81-001985 Refstie, T. TETRAPLOID RAINBOW TROUT PRODUCED BY CYTOCHALASIN B. *Aquaculture* 25(1):51-58. July 1981. SFA 26(3)
[Dep. Anim. Genet. Breeding, Agric. Univ. Norway, 1432 Ås-NLH, Norway] At the Research Station for Salmonids, Sunndalsøra Unit, tetraploid rainbow trouts have been produced by keeping newly fertilized eggs for a short time in a solution containing cytochalasin B. The purpose of this work is to produce triploid sterile fish by fertilizing normal eggs with sperm for tetraploid males.

81-001986 Riddell, B. E.; W. C. Leggett and R. L. Saunders. EVIDENCE OF ADAPTIVE POLYGENIC VARIATION BETWEEN TWO POPULATIONS OF ATLANTIC SALMON (*SALMO SALAR*) NATIVE TO TRIBUTARIES OF THE S.W. MIRAMICHI RIVER, N.B. *Can. J. Fish. Aquatic Sci.* 38(3):321-333. Mar. 1981. In English with French summ. SFA 26(3)
[Fish. Oceans Can., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

81-001987 Rjabov, I. N. PECULIARITIES OF THE DEVELOPMENT OF INTER-SUBFAMILIAL HYBRIDS OF CYPRINIDAE. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 119-124. 1981. SFA 26(3)
[A.N. Severcov Inst. Evol. Anim. Morphol. Ecol., USSR Acad. Sci., Moscow, USSR]

81-001988 Sakaizumi, M.; N. Egami and K. Moriwaki. ALLOZYMIC VARIATION IN WILD POPULATIONS OF THE FISH, *ORYZIAS LATIPES. Proc. Jpn. Acad. Ser. B Phys. Biol. Sci.* 56(7):448-451. Sept. 1980. SFA 26(3)
[Zool. Inst., Fac. Sci., Univ. Tokyo, Tokyo 113, Japan]

81-001989 Strauss, R. E. GENETIC AND MORPHOMETRIC VARIATION AND THE SYSTEMATIC RELATIONSHIPS OF EASTERN NORTH AMERICAN SCULPINS (PISCES: COTTIDAE). *Ph.D. dissertation, Pa. State Univ.* 163p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(10):3679. Apr. 1981. SFA 26(3)

81-001990 Taggart, J.; A. Ferguson and F. M. Mason. GENETIC VARIATION IN IRISH POPULATIONS OF BROWN TROUT (*SALMO TRUTTA* L.): ELECTROPHORETIC ANALYSIS OF ALLOZYMES. *Comp. Biochem. Physiol. B Comp. Biochem.* 69(3):393-412. 1981. SFA 26(3)
[Dep. Zool., Queen's Univ., Belfast, Belfast BT7 1NN, Northern Ireland] Starch gel electrophoresis and isoelectric focusing of skeletal muscle, eye, brain, liver and heart extracts of Irish brown trout populations revealed extensive genetic heterogeneity. Twenty-three enzyme systems, comprising a putative 63 loci, were examined. Polymorphism was observed at 13 loci of which four, *PGI-2*, ^{s}*AAT-4*, ^{s}*IDH-1* and ^{s}*IDH-2*, have not previously been reported as polymorphic in brown trout. The value of the relatively high level of polymorphism, (22%) is discussed with respect to salmonid genetic research and management programmes.

81-001991 Valenta, M. and A. Stratil. BIOCHEMICAL GENETICS OF THE FISH FAMILY CYPRINIDAE. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 149-152. 1981. SFA 26(3)
[Inst. Anim. Physiol. Genet., Czech. Acad. Sci., Liběchov, Czechoslovakia]

81-001992 Wolters, W. R.; G. S. Libey and C. L. Chrisman. INDUCTION OF TRIPLOIDY IN CHANNEL CATFISH. *Trans. Am. Fish. Soc.* 110(2):310-312. Mar. 1981. SFA 26(3)
[Dep. For. Nat. Resour., Purdue Univ., West Lafayette, IN 47907]

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

81-001993 Zimmerman, E. G. and M. C. Richmond. INCREASED HETEROZYGOSITY AT THE Mdh-B LOCUS IN FISH INHABITING A RAPIDLY FLUCTUATING THERMAL ENVIRONMENT. *Trans. Am. Fish. Soc.* 110(3):410-416. May 1981. SFA 26(3)
[Dep. Biol. Sci., North Tex. State Univ., Denton 76203]

BEHAVIOR

81-001994 Alayse, J. P. MISE AU POINT D'UN CIRCUIT FERME EN VUE DE PERMETTRE L'EXPERIMENTATION SUR DES LARVES ET DES JUVENILES DE POISSONS MARINS. SUIVI BIOLOGIQUE ET CHIMIQUE DE L'EVOLUTION DU MILIEU. [MODIFICATION OF A CLOSED CIRCUIT WITH A VIEW TO ALLOWING EXPERIMENTATION ON LARVAE AND JUVENILE MARINE FISH. BIOLOGICAL AND CHEMICAL MONITORING OF THE EVOLUTION OF THE ENVIRONMENT.] *Aquaculture* 23(1-4):219-230. Apr. 1981. In French with English summ. SFA 26(3)
[Lab. Biol. Anim., Fac. Sci. Tech., 29283 Brest Cedex, France]

81-001995 Baer, L. J. INTRASPECIFIC AND INTERSPECIFIC AGONISTIC COMMUNICATION AND BEHAVIOR AMONG SURGEONFISHES (FAMILY ACANTHURIDAE). *Ph.D. dissertation, Univ. Hawaii* 298p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(12):4412. June 1981. SFA 26(3)

81-001996 Balazs, G. H. and A. K. H. Kam. A REVIEW OF SHARK ATTACKS IN THE HAWAIIAN ISLANDS. *'Elepaio* 41(10):97-106. Apr. 1981. SFA 26(3)
[NMFS, Honolulu Lab., P.O. Box 3830, Honolulu, HI 96812]

81-001997 Barnett, C. THE ROLE OF URINE IN PARENT-OFFSPRING COMMUNICATION IN A CICHLID FISH. *J. Comp. Ethol.* 55(2):173-182. 1981. SFA 26(3)
[Mus. Vert. Zool., Univ. Calif., Berkeley] The fry of the Midas cichlid, *Cichlasoma citrinellum*, preferred over blank water, a urine solution from either parent or from a nonparental adult of either sex. They failed to show a preference for the urine of a predator, *C. managuense*, or for the mucus from the mother. It is possible that steroid titers in urine could provide information on sex, and that peptide chains in urine could indicate species. The chemosensory acuity of fry is high, as they were able to detect a "concentration" of pheromone as low as one sibling per 2 l of water. This high acuity implies that olfaction rather than gustation mediated the chemosensory responses described above.

81-001998 Bietz, B. F. THE ADAPTIVE SIGNIFICANCE OF TERRITORIAL AGGREGATION IN LONGEAR SUNFISH (*LEPOMIS MEGALOTIS PELTASTES* COPE). *Ph.D. dissertation, Univ. West. Ontario.* 1980. From Diss. Abstr. Int. B Sci. Eng. 41(12):4413. June 1981. SFA 26(3)

81-001999 Blaxter, J. H. S.; E. J. Denton and J. A. B. Gray. THE AUDITORY BULLAE-SWIMBLADDER SYSTEM IN LATE STAGE HERRING LARVAE. *J. Mar. Biol. Assoc. U.K.* 61(2):315-326. May 1981. SFA 26(3)
[Dunstaffnage Mar. Res. Lab., Oban, Scotland] Herring larvae, when they are about 30 mm long, swallow air and fill their auditory bullae with gas. It has been shown earlier that this is associated with a great increase in sensitivity to changes in hydrostatic pressure. Here we show that it is also associated with the appearance of a startle response to noises. At this stage of development, the utricular maculae are fully developed. However, the

BEHAVIOR (CONTINUED)

81-001999 CONTINUED bullae are bounded by thin walls which are poorly calcified and the bulla membranes are thin and contain little elastic tissue. None the less the high-frequency cut-off in the mechanical responses to oscillating pressures is as high as that of the adult. These larvae do not have gas-filled swimbladders and cannot therefore hold the volume of gas in the bullae constant as depth changes. A study of fine structure strongly supports the idea that they fill the bullae by: (1) passing air from the gut into the pneumatic duct, the entrance to which lies just anterior to a sphincter around the gut; (2) passing air from the pneumatic duct into a short muscular section of the swimbladder rudiment; and (3) contracting the muscles of the swimbladder rudiment to force small bubbles of gas along fine ducts to the bullae.

81-002000 De., S. BIOMECHANICAL ASPECTS OF UNDERWATER ACOUSTICS WITH A SPECIAL REFERENCE TO HYDROBIOLOGY. *Hydrobiologia* 78(2):153-156. 6 Mar. 1981. SFA 26(3)
[Old Eng. Off. (Q.R.S.), Santiniketan-731235, Birbhum, West Bengal, India]

81-002001 Durbin, A. G.; E. G. Durbin; P. G. Verity and T. J. Smayda. VOLUNTARY SWIMMING SPEEDS AND RESPIRATION RATES OF A FILTER-FEEDING PLANKTIVORE, THE ATLANTIC MENHADEN, *BREVOORTIA TYRANNUS* (PISCES: CLUPEIDAE). *NOAA Fish. Bull.* 78(4):877-886. Oct. 1980. SFA 26(3)
[Grad. Sch. Oceanogr., Univ. R.I., Kingston 02881]

81-002002 Gibson, R. N. and I. H. Hesthagen. A COMPARISON OF THE ACTIVITY PATTERNS OF THE SAND GOBY *POMATOSCHISTUS MINUTUS* (PALLAS) FROM AREAS OF DIFFERENT TIDAL RANGE. *J. Fish Biol.* 18(6):669-684. June 1981. SFA 26(3)
[Dunstaffnage Mar. Res. Lab., Oban, Argyll, Scotland] Sand gobies (*Pomatoschistus minutus*) collected from beaches with a large tidal range (Scotland) exhibit a circatidal rhythm of activity in constant conditions in the laboratory. There is no endogenous circadian component to the rhythm. The phasing of the rhythm is such that peak activity occurs at the predicted time of ebb tide. Light-dark (LD) cycles applied in the laboratory have a marked effect on activity greatly enhancing it at night so that the original tidal rhythm becomes nocturnal. Some evidence was obtained that LD cycles can entrain a weak nocturnal circadian rhythm in fish removed from tidal conditions. Contrary to expectations, some fish from beaches with a small and unpredictable tidal range (Oslofjord, Norway) also show a weakly persistent circatidal rhythm without an endogenous circadian component, but great variability was noticed between individual fish. Laboratory LD cycles did not entrain a persistent circadian rhythm in the fish from the Oslofjord.

81-002003 Hobson, D. S.; W. N. McFarland and J. R. Chess. CREPUSCULAR AND NOCTURNAL ACTIVITIES OF CALIFORNIAN NEARSHORE FISHES, WITH CONSIDERATION OF THEIR SCOTOPIC VISUAL PIGMENTS AND THE PHOTIC ENVIRONMENT. *NOAA Fish. Bull.* 79(1):1-30. Jan. 1981. SFA 26(3)
[NMFS, 3150 Paradise Dr., Tiburon, CA 94920]

81-002004 Hoffmann, S. G. SEX-RELATED SOCIAL, MATING, AND FORAGING BEHAVIOR IN SOME SEQUENTIALLY HERMAPHRODITIC REEF FISHES. *Ph.D. dissertation, Univ. Calif. (Santa Barbara)* 144p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(11):3996. May 1981. SFA 26(3)

BEHAVIOR (CONTINUED)

81-002005 Holland, K. N. CONDITIONED CARDIAC REFLEX AND BEHAVIORAL ASSAYS OF THE AMINO ACID SENSITITIVIES OF CHANNEL CATFISH *ICTALURUS PUNCTATUS*. *Ph.D. dissertation, Univ. Pa.* 177p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(10):3658. Apr. 1981. SFA 26(3)

81-002006 Kavaliers, M. CIRCADIAN RHYTHM OF NONPINEAL EXTRARETINAL PHOTOSENSITIVITY IN A TELEOST FISH, THE LAKE CHUB, *COUESIUS PLUMBEUS*. *J. Exp. Zool.* 216(1):7-11. Apr. 1981. SFA 26(3)
[Dep. Zool., Univ. West. Ontario, London, ON N6A 5B7, Canada]

81-002007 Kavaliers, M. SEASONAL EFFECTS ON THE FREERUNNING RHYTHM OF CIRCADIAN ACTIVITY OF LONGNOSE DACE (*RHINICHTHYS CATARACTAE*). *Environ. Biol. Fishes* 6(2):203-206. 20 May 1981. SFA 26(3)
[Dep. Zool. Entomol., Colo. State Univ., Fort Collins 80523] Freerunning circadian rhythms of locomotor activity in individual longnose dace sampled from a population at 41°N latitude were recorded under constant darkness throughout the year. There was an annual cycle in the length of the circadian period, with maximum and minimum lengths of mean period of 23.6 and 21.6 h recorded during summer (June) and winter (December), respectively. These annual changes in period length may have resulted from seasonal changes in entrainment by natural light-dark cycles and their 'after-effects' on endogenous circadian rhythms. The possibility of an endogenous circannual rhythm was also considered.

81-002008 Kennedy, G. J. A. INDIVIDUAL VARIATION IN HOMING TENDENCY IN THE EUROPEAN MINNOW, *PHOXINUS PHOXINUS* (L). *Anim. Behav.* 29(2):621-625. May 1981. SFA 26(3)
[Fish. Res. Lab., 38 Castleroe Rd., Coleraine, Co. Londonberry, Northern Ireland] The ability of minnows to accept home ranges in aquarium tanks was confirmed. Observation of individually marked fish indicated that there was variation in the tendency for individual movement. Minnows which spent the majority of their time at home showed differences in the number of forays out of the home area. Non-homing fish also varied, from individuals which moved a lot and showed no preference for any area, to others which spent most of their time in a strange area and made few forays.

81-002009 Konobeyeva, V. K.; A. G. Konobeyev and A. G. Poddubnyy. THE SCHOOLING MECHANISM OF YOUNG PERCH, *PERCA FLUVIATILIS*, IN THE OPEN PART OF LAKE-TYPE RESERVOIRS (AS EXEMPLIFIED BY RYBINSK RESERVOIR). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(2):49-62. 1980. SFA 26(3)
[Inst. Biol. Inland Waters, USSR Acad. Sci., Borok, Yaroslavol Reg., USSR]

81-002010 Laming, P. R. and G. Morrow. THE CONTRIBUTION OF THE SWIMBLADDER TO AUDITION IN THE ROACH, (*RUTILUS RUTILUS*). *Comp. Biochem. Physiol. A Comp. Physiol.* 69(3):537-541. 1981. SFA 26(3)
[Dep. Zool., Queen's Univ., Belfast, Northern Ireland] The average auditory evoked response of roach, (*Rutilus rutilus*) was monitored, in the acousticolateralis region of the medulla, in response to sounds of frequencies of between 60 and 1000 Hz. When the fishwas held in air, the responses were greater than when held in water. Deflation of the swimbladder reduced the magnitude of the evoked response, an effect reversed by by reinflation. Hyperinflation also reduced the response, especially to sounds of low frequency. It is suggested that the swimbladder of fish of this species is normally in the optimum condition for sound reception and it is the swimbladder wall which acts as the primary resonator, not the gas column within it.

BEHAVIOR (CONTINUED)

81-002011 Martin, F. D. and M. F. Hengstebeck. EYE COLOUR AND AGGRESSION IN JUVENILE GUPPIES, *POECILIA RETICULATA* PETERS (PISCES: POECILIIDAE). *Anim. Behav.* 29(2):325-331. May 1981. SFA 26(3)
[Chesapeake Biol. Lab., Cent. Environ. Estuarine Stud., Solomons, MD 20688]

81-002012 Noakes, D. L. G. and J. A. Ward. ECOLOGY AND ETHOLOGY OF FISHES. *Proc. of the 2nd Biennial Symp. Ethol. Behav. Ecol. Fishes, Normal, Ill., Oct. 19-22. 1979. 142p. 1981.* Available from Kluwer Boston, Inc., 190 Old Derby St., Hingham, MA 02043. SFA 26(3)

81-002013 Northcote, T. G. JUVENILE CURRENT RESPONSE, GROWTH AND MATURITY OF ABOVE AND BELOW WATERFALL STOCKS OF RAINBOW TROUT, *SALMO GAIRDNERI*. *J. Fish Biol.* 18(6):741-751. June 1981. SFA 26(3)
[Inst. Anim. Resour. Ecol., Univ. British Columbia, 2075 Westbrook Mall, Vancouver, BC V6T 1W5, Canada] Yong rainbow trout were propagated from adults collected from above and below a waterfall, impassable to upstream fish migration on Kokanee Creek, tributary to Kootenay Lake, British Coilumbia. The two stocks of young (above and below waterfall) were reared in a hatchery under identical temperature, light and food conditions. Their directional response to water current was tested in a laboratory migration channel during their first summer and autumn, as well as the following spring. During tests in light, both stocks of young trout showed similar current responses, but in darkness the below falls stock showed much more downstream movement in the autumn than did the above falls stock. In addition, below falls trout had a higher growth rate, were slightly heavier at the same length and matured earlier than the above falls stock. The adaptive significance of these differences are discussed in relation to maintenance of trout populations above waterfalls and to selective pressures faced by migratory below waterfall populations.

81-002014 Northcote, T. G. and B. W. Kelso. DIFFERENTIAL RESPONSE TO WATER CURRENT BY TWO HOMOZYGOUS LDH PHENOTYPES OF YOUNG RAINBOW TROUT (*SALMO GAIRDNERI*). *Can. J. Fish. Aquatic Sci.* 38(3):348-352. Mar. 1981. In English with French summ. SFA 26(3)
[Inst. Anim. Resour. Ecol., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

81-002015 Nursall, J. R. THE ACTIVITY BUDGET AND USE OF TERRITORY BY A TROPICAL BLENNIID FISH. *Zool. J. Linn. Soc.* 72(1):69-92. May 1981. SFA 26(3)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

81-002016 Richkus, W. A. LABORATORY STUDIES OF INTRASPECIFIC BEHAVIORAL INTERACTIONS AND FACTORS INFLUENCING TIDEPOOL SELECTION OF THE WOOLY SCULPIN, *CLINOCOTTUS ANALIS*. *Calif. Fish Game* 67(3):187-195. July 1981. SFA 26(3)
[Environ. Cent., Martin Marietta Corp., 1450 S. Rolling Rd., Baltimore, MD] Behavioral interactions of the wooly sculpin, *Clinocottus analis*, and their preference for tidepool characteristics (depth, amount of cover, and height of cover above bottom) were tested in an experimental pool containing artifical "potholes." Fish tended to select deeper potholes and greatest amounts of cover, but statistically significant preferences were not shown consistently. Strong behavioral interaction was noted, evidenced by a propensity for aggregation. Interactions were more evident in larger fish (>45mm) than in smaller ones. Fish exhibited following behavior and a kinesis-type response to the presence of other individuals, with both behavioral patterns leading to the formation of aggregations. This behavior would appear to ensure the survival of fish straying from their home territory into novel surroundings where suitability of tidepools for survival during low tides would be unknown.

BEHAVIOR (CONTINUED)

81-002017 Ross, L. G.; W. Watts and A. H. Young. AN ULTRASONIC BIOTELEMETRY SYSTEM FOR THE CONTINUOUS MONITORING OF TAIL-BEAT RATE FROM FREE-SWIMMING FISH. *J. Fish Biol.* 18(4):479-490. Apr. 1981. SFA 26(2)
[Biol. Dep., Univ. Stirling, Stirling FK9 4LA, Scotland] A telemetry system for the continuous monitoring of tail beats, and hence swimming activity, from loch-dwelling brown trout, *Salmo trutta* L., is described. Tail beats are detected by electromyography and are transmitted using a specially-developed miniature ultrasonic transmitter. The output from the transmitter is relayed to a remote recording station using a radio-transponder buoy. Data analysed to date show that on average fish are active for only 9% of the time. Tail beat rates rarely exceeded 2.5 tail-beats per second (TB/s) corresponding to a velocity of 1 body length per second. The fish showed a 'preferred' tail-beat rate of 1.0-2.0 TB/s and consequently they rarely swam at speeds which would incur oxygen debt.

81-002018 Sal'nikov, N. Ye.; H. A. Hussein and E. M. Amin. SOME BEHAVIORAL FEATURES AND FISHING OF THE EUROPEAN EEL, *ANGUILLA ANGUILLA*, IN LAKE BURULLUS (EGYPT). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(2):153-158. 1980. SFA 26(3)
[VNIRO, Moscow, USSR]

81-002019 Sbikin, Ju. N. PECULIARITIES OF PERCEPTION IN FISHES OF DIFFERENT ECOLOGY. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 125-127. 1981. SFA 26(3)
[A.N. Severcov Inst. Evol. Anim. Morphol. Ecol., USSR Acad. Sci., Moscow, USSR]

81-002020 Silvert, W. COMMENT ON OPTIMUM SWIMMING SPEEDS IN FISH. *Can. J. Fish. Aquatic Sci.* 38(6):729-730. June 1981. SFA 26(3)
[Dep. Fish. Oceans, Mar. Ecol. Lab., Bedford Inst. Oceanogr., P.O. Box 1006, Dartmouth, NS B2Y 4A2, Canada]

81-002021 Taborsky, M. and D. Limberger. HELPERS IN FISH. *Behav. Ecol. Sociobiol.* 8(2):143-145. Apr. 1981. SFA 26(3)
[Max-Planck-Inst. Verhaltensphysiol., D-8131 Seewiesen, West Germany] Field data show that in the cichlid fish *Lamprologus brichardi* conspecifics other than the reproducing pair help in brood care and territory maintenance. The expected degree of relatedness between helpers and the eggs or larvae they tend lies between 0.25 and 0.5, decreasing with the helper's age. This decrease might influence the point of time at which helpers depart. Five other endemic Lake Tanganyika cichlids showing rather similar helping behaviour are described.

81-002022 Tsuchiya, A.; Y. Ohta; M. Nishimura and C. Miyazaki. CORRELATION ANALYSIS OF MAN-MADE UNDERWATER SOUND AND FISH BEHAVIOR. *J. Fac. Mar. Sci. Technol. Tokai Univ.* No. 14. 325-341. 1981. SFA 26(3)
[Fac. Mar. Sci. Technol., Tokai Univ., Japan]

81-002023 Valinski, W. and L. Rigley. FUNCTION OF SOUND PRODUCTION BY THE SKUNK LOACH *BOTIA HORAE* (PISCES, COBITIDAE). *J. Comp. Ethol.* 55(2):161-172. 1981. SFA 26(3)
[Dep. Biol., Wilkes Coll., Wilkes-Barre, PA] In agonistic interactions with conspecifics, skunk loaches (*Botia horae*) typically exhibit lateral displays, attacks, and produce a sound (a "click"). Four experiments were

BEHAVIOR (CONTINUED)

81-002023 CONTINUED conducted to determine the functional significance of the click sound. Behaviors of resident fish were monitored while characteristics of their shelter and the size or type of intruder fish introduced were varied. Manipulations in the four experiments involved: 1) the configuration of the available shelter; 2) the size or recent history of intruder fish; 3) playbacks of "click" sounds or aquarium noise; or 4) muting of resident fish. Lateral displays, attacks, and sounds proudced by residents were monitored, and the responses of residents were analyzed in terms of the functional significance of "click" sounds to juvenile skunk loaches.

81-002024 Webb, P. W. and R. T. Corolla. BURST SWIMMING PERFORMANCE OF NORTHERN ANCHOVY, *ENGRAULIS MORDAX*, LARVAE. *NOAA Fish. Bull.* 79(1):143-150. Jan. 1981. SFA 26(3)

[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109] Burst swimming performance was measured for northern anchovy larvae from 0.23 to 1.33 cm total length at a temperature of 17°C. Fast starts and burst swimming were initiated using a 3 V/cm direct current electric shock. Performance was measured from movie film recorded at 250 frames/s. Precentages of larvae responding to the stimulus increased from 9% 40 hours after eggs were spawned to a maximum of 95±4% after 125 hours. Distances traveled in a given time period increased linearly with length so that maximum speed (Umax) and mean speed ($\bar{U}$) similarly increased linearly with total length (L) according to $U\text{max} = 20.8L + 1.95$; $\bar{U} = 8.18L + 4.89$. The maximum distance traveled per burst (Smax) was used as a measure of endurance and increased with length according to $S\text{max} = 3.79L + 0.08$. These swimming speeds and endurance relationships can explain a large portion of size-dependent selectivity of towed plankton nets.

81-002025 Weihs, D. EFFECTS OF SWIMMING PATH CURVATURE ON THE ENERGETICS OF FISH MOTION. *NOAA Fish. Bull.* 79(1):171-176. Jan. 1981. SFA 26(3)

[Dep. Aeronaut. Egn., Isr. Inst. Technol., Haifa, Israel]

LIFE HISTORY-GENERAL WORKS

81-002026 Abramov, A. A. and A. N. Kotlyar. SOME BIOLOGICAL FEATURES OF THE PERUVIAN JACK MACKEREL, *TRACHURUS SYMMETRICUS MURPHYI*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):25-31. 1980. SFA 26(3)

[VNIRO, Moscow, USSR]

81-002027 Banerji, S. R.; M. L. Singh and N. K. Thakur. OBSERVATIONS ON NATURAL BREEDING AND LARVAL DEVELOPMENT OF THE COMMON MUD-EEL *AMPHIPNOUS CUCHIA* (HAM.). *Hydrobiologia* 79(2):147-155. 27 Mar. 1981. SFA 26(3)

[Fish. Res. Inst., Mithapur Farm, Patna 800001, Bihar, India] *Amphipnous cuchia* is a rare fish in India with a spawning period confined down to peak summer. The fish lays its eggs in especially prepared nest-holes and keeps a guard on the developing young ones. The yolk reserve persists till about 22 to 24 days of development. Larvae respond to direct feeding even before yolk-absorption. The young ones feed actively on chironomus larvae. Surface breaking habit for aerial respiration apparently commences around 15th-16th day of larval life. Adult characters are almost attained in about a month's time.

81-002028 Blackburn, M. and D. L. Serventy. OBSERVATIONS ON DISTRIBUTION AND LIFE HISTORY OF SKIPJACK TUNA, *KATSUWONUS PELAMIS*, IN AUSTRALIAN WATERS. *NOAA Fish. Bull.* 79(1):85-94. Jan. 1981. SFA 26(3)

LIFE HISTORY-GENERAL WORKS (CONTINUED)

81-002028 CONTINUED
[741 Washington Way, Friday Harbor, WA 98250] Skipjack tuna occur in many areas around Australia, but have been little fished or investigated there because of low commercial demand. Their distribution in Australian coastal waters is not continuous, although suitable temperatures occur in all areas. Abundance in coastal waters is probably highest in the southeast. The southern limit of skipjack tuna range varies seasonally with the 15°C surface isotherm, and that temperature appears to be limiting. Length-frequency polygons for skipjack tuna of southeastern Australia show modes at about 37, 46, 53, and 59 cm fork length in the southern summer. The regression of weight *W* (grams) upon length *L* (millimeters) for east coast skipjack tuna is $W=0.000000839\ L^{3.5202}$. Gonads of coastal skipjack tuna are all immature. The euphausiid *Nyctiphanes australis* is the principal food in east Australian waters south of latitude 34°S. Small fish such as clupeoids are eaten in some of those areas and are the principal food elsewhere.

81-002029 Buynak, G. L.; A. J. Gruzynski and H. W. Mohr, Jr. AGE AND GROWTH, FOOD HABITS, AND ABUNDANCE OF WALLEYE (*STIZOSTEDION VITREUM*) IN THE SUSQUEHANNA RIVER NEAR BERWICK, PENNSYLVANIA. *Proc. Pa. Acad. Sci.* 54(2):136-140. 1980. SFA 26(3)
[Ichthyological Assoc., Inc., R.D. 1, Berwick, PA 18603] Maximum growth of walleye (*Stizostedion vitreum*) in the Susquehanna River near Berwick, Pennsylvania, occurred between July and September. Walleye in the river should enter the fishery as a legal sized fish in their third year of life. Minnows were the most important forage organisms for age 0+, I+, and II+ walleye. Food habits of older walleye could not be determined since too few were captured. Forage consumed by age 0+ and I+ walleye was similar in length, weight, and body depth. Forage consumed by age II+ walleye however, was found to be much larger. There was an increased tendency for walleye to consume more than one forage as they became older. Most feeding occurred during the night. The angling catch of walleye should increase in the next few years as a result of the strong year classes produced in 1978 and 1979.

81-002030 Druzhinin, A. D. and N. A. Filatova. SOME DATA ON LUTJANIDAE FROM THE GULF OF ADEN AREA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):8-14. 1980. SFA 26(3)
[VNIRO, Moscow, USSR]

81-002031 Facey, D. E. and G. W. LaBar. BIOLOGY OF AMERICAN EELS IN LAKE CHAMPLAIN, VERMONT. *Trans. Am. Fish. Soc.* 110(3):396-402. May 1981. SFA 26(3)
[G.W. LaBar: Sch. Nat. Resour., Univ. Vt., Burlington 05405]

81-002032 Goeden, G. B. A MONOGRAPH OF THE CORAL TROUT *PLECTROPOMUS LEOPARDUS* LACÉPÈDE. *Queensl. Fish. Serv. Res. Bull.* No. 1. 42p. 1978. SFA 26(3)
[Queensland Fish. Serv., P.O. Box 36, North Quay, Brisbane, Queensland 4000, Australia] The biology and ecology of the serranid, *Plectropomus leopardus* (Lacépède), was investigated. *P. leopardus* undergoes a relatively constant annual increase of 100 mm in standard length and an isometric weight increase throughout its first five years. This strategy of rapid growth counterbalances an average annual mortality rate of 46% (2 year olds and older) which limits most individuals to a life span of five to six years. While the average population density of *P. leopardus* on a coral reef with very low levels of exploitation was 67.8 fish per hectare (S.D. = 25.9), their distribution over the habitat mosaic of the reef slope was significantly patchy but predictable. Factors influencing the distribution of each age class of *P. leopardus* were the distribution of the symbiotic

LIFE HISTORY-GENERAL WORKS (CONTINUED)

81-002032 CONTINUED "cleaner" fishes, *Labroides dimidiatus* (Valenciennes) and *Lepidaplois axillaris* (Bennet), the relative size and feeding behaviour of localized prey fish assemblages, and the availability of cover. Trophically, *P. leopardus* is a voracious carnivore whose feeding behaviour changes with age. These changes are described in relation to stomach content analysis and time of feeding. A degree of intraspecific spacing is maintained through agressive social behaviour which varies in frequency with age; however occasional and temporary associations are formed during feeding and in habitats with apparently inadequate cover. Investigations into the home range of this non-nomadic species revealed that, on a short term basis, the area of search of an individual was correlated with weight and presumably, to the energy requirements of the organism. Individuals may remain in the same area in excess of ten months. Reproductively, *P. leopardus* is a protogynous hermaphrodite. The primary benefits of this mechanism under conditions of natural mortality lie in the similarity to reproduction via the harem, where the genetic material is in large part, contributed by the better adapted individuals. This mechanism may be dangerous where fishing mortality is great enough to remove the larger and therefore, male fish from the population. Secondary benefits relating to population fluctuation buffering, energy savings through lowered individual fecundity, and refinement of controls over the reproductive potential of the population are illustrated through a variety of population models.

81-002033 Heins, D. C. LIFE HISTORY PATTERN OF *NOTROPIS SABINAE* (PISCES: CYPRINIDAE) IN THE LOWER SABINE RIVER DRAINAGE OF LOUISIANA AND TEXAS. *Tulane Stud. Zool. Bot.* 22(2):67-84. 3 May 1981. SFA 26(3)

[Dep. Biol., Millsaps Coll., Jackson, MS 39210] The life history of *Notropis sabinae* in two tributary streams of the lower Sabine River drainage system (Bayou Anacoco, Beauregard-Vernon Parish line, Louisiana; Big Cow Creek, Newton County, Texas) was studied from 1972 to 1977. The life history pattern observed for the two streams was similar. In Bayou Anacoco, the reproductive season extended from early April through late September; it was similar in Big Cow Creek except that reproduction ended earlier in September 1973. Counts of unovulated mature ova in females ranged from 113 to 423 for females 35-48 mm SL and were significantly correlated with female size. There was a low but significant correlation between the ovary weight-somatic weight ratio and body size among Bayou Anacoco females, but not among Big Cow Creek females. A low but significant correlation was found between mean mature ovum size and body size among females from both localities. The size of unovulated mature ova ranged from 0.55 to 0.88 mm diameter. There were no significant differences in slope or elevation of regression lines fitted to either fecundity or ova size data for each of the two localities. Sex ratios did not differ significantly from 1:1. Females matured at a slightly larger size than males; all females were mature by 32 mm in Bayou Anacoco and 33 mm in Big Cow Creek. Mean sizes of adult males and females did not differ significantly. Maximum age for most individuals of *Notropis sabinae* was about 1½ to 2 years. Maximum size was 49 and 47 mm SL for Big Cow Creek and Bayou Anacoco, respectively.

81-002034 Jellyman, D. J. AGE, GROWTH, AND REPRODUCTION OF PERCH, *PERCA FLUVIATILIS* L., IN LAKE POUNUI. *N.Z. J. Mar. Freshwater Res.* 14(4):391-400. 1980. SFA 26(3)

[Fish. Res. Div., Private Bag, Christchurch, New Zealand] Ages of 1052 perch (*Perca fluviatilis* L.) from Lake Pounui, Wairarapa, were calculated from annual bands in the opercular bones. Growth was seasonal, with no significant increase in length occurring between April and October. For these months combined, back-calculations of length at previous age were generallly significantly different from the mean length per age class. Females grew faster than males, and growth in both sexes fitted the von Bertalanffy growth model. Seasonal changes in condition and gonad weight for each sex were studied by calculating mean monthly total and gonad weights for a given

LIFE HISTORY-GENERAL WORKS (CONTINUED)

81-002034 CONTINUED length. The reproductive cycle was examined further by recording stages of gonad development and calculating gonadosomatic indices. Fecundity from 66 females ranged from 2657 to 63858. Females dominated all samples, with an overall male: female ratio of 1:4, although seasonal variation was noted; the highest proportion of males, 1:1.7, occurred immediately before spawning.

81-002035 Johnson, J. H. and N. H. Ringler. NATURAL REPRODUCTION AND JUVENILE ECOLOGY OF PACIFIC SALMON AND RAINBOW TROUT IN TRIBUTARIES OF THE SALMON RIVER, NEW YORK. *N.Y. Fish Game J.* 28(1):49-60. Jan. 1981. SFA 26(3)

[N.Y. State Dep. Environ. Conserv., 50 Wolf Rd., Albany 12233] The extent of natural reproduction of Pacific salmon and rainbow trout was examined from May through November in 1977 in five tributaries of the Salmon River in New York. Juvenile coho salmon and rainbow trout were found in all the streams studied. Variation in fry density between streams was much greater for the salmon than for the trout. Orwell Brook contained the highest density of coho fry. Rainbow trout fry were abundant in four of the five streams. Natural reproduction of chinook salmon was minimal in the study streams, but chinook smolts were seined along the shore of Lake Ontario near the Salmon River estuary during May, June and early July in 1977 and 1978. Peak emergence of coho salmon occurred about June 1, but emergence of rainbow trout fry appeared to extend from early June to August. In all the streams, most coho salmon evidently left during their first year, while virtually all the rainbow trout left before the age of two. However, migration of juvenile salmonids may have occurred before sampling was begun during mid-May in 1977.

81-002036 Koz'min, A. K. THE BIOLOGY OF THE PIKE, *ESOX LUCIUS*, FROM LAKE LACHA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):44-48. 1980. SFA 26(3)

[VNIRO, Moscow, USSR] Data on the size-age and sexual composition of the population, the nature of spawning, rate of growth and sexual maturation, the condition and feeding of the pike in Lake Lacha are given. With the aim of increasing the abundance of this species, it is proposed to halve pike catches during the spring period, to regulate recreational fishing and to restrict the commercial catch to 20-25 tons a year.

81-002037 Lehtonen, H. BIOLOGY AND STOCK ASSESSMENTS OF COREGONIDS BY THE BALTIC COAST OF FINLAND. *Finn. Fish. Res.* 3:31-83. 1981. SFA 26(3)

[Finn. Game Fish. Res. Inst., P.O. Box 193, SF-00131 Helsinki 13, Finland] The Baltic waters by the coast of Finland are inhabited by sea-spawning whitefish (*Coregonus widegreni* Malmgren), river-spawning whitefish (*Coregonus lavaretus* L. s. str.) and vendace (*Coregonus albula* L.). Sea-spawning whitefish form the bulk of the whitefish catch in the Bothnian Bay and at most half elsewhere. Whitefish produce 20,000-25,000 eggs per kg of body weight and just before spawning the eggs form about 20% of the body weight. Males attain sexual maturity at 3-4 years, females at 4-5 years. River-spawning whitefish migrate over wide areas, whereas sea-spawning whitefish are more stationary. The growth rate of sea-spawning whitefish increases from north to south and from east to west. The river-spawning species grows faster than the sea-spawning species. The growth period begins in June. Yield per recruit analyses indicated that the top of the yield curve is almost reached in the Gulf of Bothnia, but not in the Gulf of Finland. In the Archipelago Sea the top has been passed. In 1979 the total catch of Baltic whitefish in Finland was about 2,000 tonnes and most of them were caught with gill nets. The recommended age for first capture is 5-7 years. Vendace are almost entirely restricted to the north of the Gulf of Bothnia. Both sexes start spawning after the second summer. In older age-groups females predominate. Egg production averages about 4,700 eggs per a female, but varies rather widely. The growth rate off Kemi is slower than off Oulu. The growing period begins in May or June. The year class

LIFE HISTORY-GENERAL WORKS (CONTINUED)

81-002037 CONTINUED fluctuations are probably irregular. In 1979 the total Finnish catch was 465 tonnes. Yield per recruit analyses showed that the top of the yield curve is almost reached. In 1976-1979 the population biomass in the Finnish part of the Bothnian Bay varied between 2,760 and 3,370 tonnes, averaging about 3,000 tonnes.

81-002038 Lowry, L. F. and K. J. Frost. DISTRIBUTION, GROWTH, AND FOODS OF ARCTIC COD (*BOREOGADUS SAIDA*) IN THE BERING, CHUKCHI, AND BEAUFORT SEAS. *Can. Field-Nat.* 95(2):186-191. Apr.-June 1981. SFA 26(3)

[Alaska Dep. Fish Game, 1300 College Rd., Fairbanks 99701] Arctic Cod (*Boreogadus saida*) are abundant and ecologically important in arctic and subarctic marine ecosystems. Based on otter trawl collections made in the northern Bering and northeastern Chukchi and Beaufort seas, Arctic Cod were most abundant in the northeastern Chukchi and western Beaufort seas. There was no relationship between water depth and abundance; however, in the Chukchi and Beaufort seas small fishes were more common in water less than 100 m deep. Annual growth increments appear to be quite variable which complicates interpretation of size at age data. Arctic Cod less than 4 yr were larger at a given age in the Bering Sea. In the Bering Sea gammarid amphipods were the main food with mysids, shrimps, and hyperiid amphipods also eaten. In the northeastern Chukchi and Beaufort seas, calanoid copepods were by far the predominant prey with other crustaceans eaten much less frequently. Arctic Cod appear to be a very adaptable species which may explain their overwhelming success in Arctic marine waters.

81-002039 Marshall, K. E. A BIBLIOGRAPHY OF THE ARCTIC CHARR, *SALVELINUS ALPINUS* (L.) COMPLEX TO 1980. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1004. iv + 68p. Apr. 1981. In English with French summ. SFA 26(3)

[Dep. Fish. Oceans, Winnipeg, MB R3T 2N6, Canada]

81-002040 McComish, T. S. NOTES ON THE BIOLOGY OF THE YELLOW PERCH IN INDIANA WATERS OF LAKE MICHIGAN IN THE 1970's. *Proc. Indiana Acad. Sci.* 89:148-149. 1980. Abstract only. SFA 26(3)

[Dep. Biol., Ball State Univ., Muncie, IN 47306] Selected aspects of the life history of the yellow perch (*Perca flavescens*) were investigated from 1970 to 1978 in the Indiana waters of Lake Michigan. Young-of-the-year (YOY) perch ate primarily cladocera and copepods (zooplankton) and chironomid larvae (zoobenthos). Larger perch (≥ age I) ate mainly chironomid larvae (zoobenthos) and alewife (*Alosa pseudoharengus*) eggs and YOY fish. Both YOY and larger perch fed at or near the bottom. Length x weight relationships for perch from 1976 to 1978 were similar comparing males for each of the years and for females in each of the three years. Body x scale length relationships were linear and highly correlated in each year. The mean estimated length at scale formation was 39 mm. Growth by year was summarized and females grew faster than males after age I. All males were sexually mature by age II (150 to 160 mm) while females were not all mature until age IV (230 to 240 mm). Commercial harvest in Indian waters results in high mortality af age III and IV fish and therefore numbers of age V and older fish is greatly reduced compared to nearby Michigan waters (New Buffalo) where commercial harvest is restricted.

81-002041 Peňáz, M. and J. Kokeš. NOTES ON THE DIET, GROWTH AND REPRODUCTION OF *CARASSIUS AURATUS GIBELIO* IN TWO LOCALITIES IN SOUTHERN SLOVAKIA. *Folia Zool.* 30(1):83-94. 1981. SFA 26(3)

[Inst. Vert. Zool., Czech. Acad. Sci., Brno, Czechoslovakia]

LIFE HISTORY-GENERAL WORKS (CONTINUED)

81-002042 Ralston, S. ASPECTS OF THE REPRODUCTIVE BIOLOGY AND FEEDING ECOLOGY OF *CHAETODON MILIARIS*, A HAWAIIAN ENDEMIC BUTTERFLYFISH. *Environ. Biol. Fishes* 6(2):167-176. 20 May 1981. SFA 26(3)

[NMFS, P.O. Box 3830, Honolulu, HI 96812] Aspects of the reproduction and diet of the butterflyfish, *Chaetodon miliaris*, were studied by examining 345 individuals collected around Oahu, Hawaiian Islands. The sex ratio of this species was uniform and annual spawning activity was periodic yet seasonally protracted, extending through the winter and spring months (January-May). No lunar influence on spawning was detected. Fecundity was quadratically related to fish weight, implying an abrupt shift in the use of energy resources at the time of maturity from growth to reproduction. Gut contents showed that calanoid copepods and other zooplankton comprised the major portion of the diet although benthic prey were commonly taken. Dietary composition varied with season, locality, and size of fish. Based upon comparisons with other *Chaetodon* spp. the diet of *C. miliaris* appears to be relatively opportunistic.

81-002043 Reznick, D. N. LIFE HISTORY EVOLUTION IN THE GUPPY (*POECILIA RETICULATA*). *Ph.D. dissertation, Univ. Pa.* 238p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(10):3678. Apr. 1981. SFA 26(3)

81-002044 Richardson, S. L. SPAWNING BIOMASS AND EARLY LIFE OF NORTHERN ANCHOVY, *ENGRAULIS MORDAX*, IN THE NORTHERN SUBPOPULATION OFF OREGON AND WASHINGTON. *NOAA Fish. Bull.* 78(4):855-876. Oct. 1980. SFA 26(3)

[Gulf Coast Res. Lab., East Beach Dr., Ocean Springs, MS 39564] A major spawning center for the northern subpopulation of northern anchovy, *Engraulis mordax*, is documented off the Oregon-Washington coast beyond the continental shelf, based on collections of planktonic eggs in July 1975 and July 1976. Biomass estimates of northern anchovy in this spawning concentration ranged from 262,506 to 769,511 metric tons in 1975 and 144,654 to 1,005,263 metric tons in 1976, based on egg and larvae surveys. Spawning biomass was estimated to be 800,000 metric tons in 1977, based on an acoustic survey of adults. The most probable biomass may be more than 100,000 but less than 1,000,000 metric tons. Potential yield estimates ranged from 86,792 to 633,316 metric tons, but realizable yields may be considerably lower if management strategies applied to northern anchovy in the central subpopulation are implemented for the northern subpopulation. Spawning appears to be associated with waters of the Columbia River plume which may provide favorable conditions, in terms of stability and productivity, for survival of first feeding northern anchovy larvae. Evidence of larval transport south away from the spawning center leads to questions about return mechanisms to explain the occurrence of juveniles in Oregon bays and rivers later in the season. Additional spawning centers within the range of the northern subpopulation have not been documented although some evidence from the literature indicates another spawning center may occur in the Strait of Georgia, British Columbia, aroung the Fraser River plume. Conditions related to spawning differ between the northern and central subpopulation. Off Oregon, spawning occurs from mid-June to mid-August, when current flow to the south is at a maximum, water temperatures are reaching maximum levels for the year, coastal upwelling is at a maximum, and day length is at or near maximum duration. Off California, peak spawning occurs from January through April when southward current flow is minimal, water temperatures are reaching minimal levels for the year, upwelling is minimal, and day length is at minimum duration. These factors are indicative of some degree of reproductive isolation as well as differing reproductive strategies between the two subpopulations.

81-002045 Witte, F. INITIAL RESULTS OF THE ECOLOGICAL SURVEY OF THE HAPLOCHROMINE CICHLID FISHES FROM THE MWANZA GULF OF LAKE VICTORIA (TANZANIA): BREEDING PATTERNS, TROPHIC AND SPECIES DISTRIBUTION. *Neth. J.*

LIFE HISTORY-GENERAL WORKS (CONTINUED)

81-002045 CONTINUED *Zool.* 31(1):175-202. Mar. 1981. SFA 26(3)
[c/o. Dr. C. D. N. Barel, Zool. Lab., Kaiserstr. 63, Postbus 9516, 2300 RA Leiden, The Netherlands] Ecological investigations on the haplochromine Cichlidae from the Mwanza Gulf of Lake Victoria revealed that more than 140 species are living in the habitats fished with bottom trawlers (*i.e.* all major habitats except rocky bottoms, dense plant stands and very shallow water). These species can be classified into 9 trophic groups. The phytoplankton/detritus eaters and the zooplanktophages (both belonging to the smaller species) form the dominant group in the sublittoral waters with a mud bottom, while insect eaters dominate in shallower water, especially over sand. Most haplochromine species appear to be strongly habitat-restricted throughout life. Breeding of the bulk of the haplochromine species (phytoplankton/detritus eaters, zooplanktophages and some insectivores) in the sublittoral and littoral waters with a mud bottom appears to be seasonal. Spawning takes place at the end of the rainy season. However, some species of the littoral sand habitat breed throughout the year. A discussion is given of the factors by which the seasonal breeding pattern might be imposed. For an optimal trawl fishery recommendations based on the present data are discussed.

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC.

81-002046 Alevizon, W. and D. Colton. DIURNAL VARIATION IN VISUALLY ESTIMATED POPULATION DENSITIES OF CORAL REEF FISHES. *Fla. Sci.* 44(Suppl. 1):22. 1981. Abstract only. SFA 26(3)
[Dep. Biol. Sci., Fla Inst. Technol., Melbourne 32901] Bahamian coral reef fishes were visually censused along a 100x4 m transect at four times of day: 0900, 1200, 1500, and 1800 hours. One sample per day was obtained at each time period over a span of 20 consecutive days. Of the 42 species recorded in these samples, 25 occurred frequently enough to permit statistical analysis of diurnal variation in abundance. Nearly one fourth of these (6 species) displayed significant differences in their abundance patterns among the four time periods. It is therefore suggested that repetitive visual sampling of coral reef fishes be carried out at about the same time of day to minimize bias, which might otherwise be introduced.

81-002047 Boreman, J. CHARACTERISTICS OF FALL AND SPRING MIGRANT RAINBOW TROUT IN CAYUGA INLET, NEW YORK. *N.Y. Fish Game J.* 28(1):100-107. Jan. 1981. SFA 26(3)
[Northeast Fish. Cent., NMFS, Woods Hole, MA 02543] The fall and spring migrations of rainbow trout in Cayuga Inlet were studied over a 5-year period to assess their relative importance to annual egg production. Differences in age composition, sex ratio and length composition indicated that younger fish moved upstream earlier in the pre-spawning migration than older fish. The fall runs were dominated by males, which were generally younger than the females. Fall-run rainbow trout probably made and important contribution to the annual production of viable eggs in Cayuga Inlet.

81-002048 Coulter, G. W. BIOMASS, PRODUCTION, AND POTENTIAL YIELD OF THE LAKE TANGANYIKA PELAGIC FISH COMMUNITY. *Trans. Am. Fish. Soc.* 110(3):325-335. May 1981. SFA 26(3)
[Ecol. Div., Dep. Sci. Indus. Res., P.O. Box 415, Taupo, New Zealand]

81-002049 Fraser, J. M. ESTIMATES OF THE STANDING STOCKS OF FISHES IN FOUR SMALL PRECAMBRIAN SHIELD LAKES. *Can. Field-Nat.* 95(2):137-143. Apr.-June 1981. SFA 26(3)

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

81-002049 CONTINUED
[Res. Sect., Fish. Br., Ontario Minist. Nat. Resour., Maple, ON L0J 1E0, Canada] Estimates of the standing stocks of fishes in four small Precambrian Shield lakes ranged from 35.2 to 50.8 kg/ha at the time of reclamation with a fish toxicant. In three lakes with similar species composition, White Suckers (*Catostomus commersoni*) comprised 50% (49-62), Golden Shiners (*Notemigonus crysoleucas*) 18% (13-25), and planted Brook Trout (*Salvelinus fontinalis*) 14% (11-17) of total standing stocks. In the fourth lake, Pumpkinseeds (*Lepomis gibbosus*), Brown Bullheads (*Ictalurus nebulosus*), and planted Brook Trout contributed 58, 19, and 13%, respectively, of the total standing stock of 50.7 kg/ha. The relatively rigorous proportionality among species, evident for both communities, and the similarity of their standing stocks of fishes suggest that the carrying capacities of the lakes had been reached.

81-002050 Godø, O. R. and R. Toresen. AKUSTISK MENGDEMÅLING AV BUNNFISK PÅ MØREKYSTEN I MARS 1980. [ACOUSTIC ABUNDANCE ESTIMATION OF DEMERSAL FISH IN THE COASTAL AREA OF MØRE IN MARCH 1980.] *Fisken Havet* 1981(1):21-36. 1981. In Norwegian with English summ. SFA 26(3)
[Inst. Mar. Res., Bergen, Norway]

81-002051 Godø, O. R. VINTERTORSKEFISKET PÅ MØRE - SØR-TRØNDELAGSKYSTEN I 1980. [THE SPAWNING SEASON FISHERY OF COD AT THE MØRE - SØR-TRØDELAG COAST IN 1980.] *Fisken Havet* 1981(1):37-48. 1981. In Norwegian with English summ. SFA 26(3)
[Inst. Mar. Res., Bergen, Norway]

81-002052 Godø, O. R. ALDERS-LENGDEFORHOLD FOR KYSTTORSK I FANGSTER FRA MØREKYSTEN. [AGE-LENGTH RELATIONSHIP IN COASTAL COD (*GADUS MORHUA* L.) FROM CATCHES AT THE MØRE COAST.] *Fisken Havet* 1981(1):11-19. 1981. In Norwegian with English summ. SFA 26(3)
[Inst. Mar. Res., Bergen, Norway]

81-002053 Hecky, R. E.; E. J. Fee; H. J. Kling and J. W. M. Rudd. RELATIONSHIP BETWEEN PRIMARY PRODUCTION AND FISH PRODUCTION IN LAKE TANGANYIKA. *Trans. Am. Fish. Soc.* 110(3):336-345. May 1981. SFA 26(3)
[Dep. Fish. Oceans, Freshwater Inst., 501 University Crescent, Winnipeg, MB R3T 2N6, Canada]

81-002054 Kwain, W. POPULATION DYNAMICS AND EXPLOITATION OF RAINBOW TROUT IN STOKELY CREEK, EASTERN LAKE SUPERIOR. *Trans. Am. Fish. Soc.* 110(2):210-215. Mar. 1981. SFA 26(3)
[Fish. Res. Sect. Fish. Br., Ontario Minist. Nat. Resour., Sault Ste. Marie, ON P6A 2B3, Canada]

81-002055 Lehtonen, H. STOCK ASSESSMENT OF PIKE-PERCH (*STIZOSTEDION LUCIOPERCA* L.) IN THE HELSINKI SEA AREA. *Finn. Fish. Res.* 3:1-12. 1981. SFA 26(3)
[Finn. Game Fish. Res. Inst., P.O. Box 193, SF-00131 Helsinki 13, Finland] Of 2,075 tagged pike-perch 361 were recaptured and reported. The most distant recovery was made 300 km from the place of release, but the fish were usually recaptured within a distance of 10 km. The pike-perch spawn in inlets and winter in deeper waters between islands and near the open sea. In the Helsinki sea area there are three separate pike-perch populations. The total

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

81-002055 CONTINUED annual mortality rate was estimated at 0.78 for pike-perch measuring 31 cm and more. The natural mortality rate was estimated to be 0.05-0.15. Growth takes place mainly between late July and early October. In 1970-1971 the catch per 1,000 recruits (age 3 years) was 190-260 kg and the equilibrium yield was nearly reached. Since then the fishing effort has more than doubled and the equilibrium yield may have been passed. The average density of age 3 and older pike-perch was in summer 26-42 ind./ha and the average biomass 8.4-12.6 kg/ha.

81-002056 Martin, J. D. NATURAL FISH POPULATIONS IN TWO STREAMS OF THE NASHWAAK EXPERIMENTAL WATERSHED. *Can. Tech. Rep. Fish Aquatic Sci.* No. 982. iii + 17p. Dec. 1980. In English with French summ. SFA 26(3)

[Biol. Stn., St. Andrews, NB E0G 2X0, Canada] Fish sampling data are summarized from 1972-78, inclusive, prior to clearcutting on two streams of the Nashwaak Experimental Watershed Project. Hayden Brook was chosen to serve as the control and Narrows Mountain Brook as the experimental stream. The study area on Narrows Mountain Brook includes an upper (clearcut to the stream bank in winter 1978), and a lower site (with a 60-m wide riparian strip on either side, cut at the same time as the upper). Major species of fish caught include brook trout (*Salvelinus fontinalis*), Atlantic salmon (*Salmo salar*), American eel (*Anguilla rostrata*), slimy sculpin (*Cottus cognatus*), and blacknose dace (*Rhinichthys atratulus*). Estimated annual numbers of brook trout fluctuated by over 100% (Hayden Brook 11.9-26.5, Narrows Mountain, lower site 7.3-19.2 and Narrows Mountain, upper site 46.4-97.8 per 100 m^2) under natural environmental conditions. Salmon parr and fry numbers fluctuated twentyfold. Upstream migrations of trout, salmon, and eels occurred in the study streams between May and July from the Nashwaak River. Subsequent downstream migrations occurred in the fall. These migrations were probably seasonally temperature related. At least the lower kilometer of each stream serves as a nursery area for juvenile Atlantic salmon from the Nashwaak River. Brook trout in the study streams seldom exceeded 3 yr of age or 15 cm fork length under natural environmental conditions and were closed to angling.

81-002057 Sekulich, P. T. THE CARRYING CAPACITY OF INFERTILE FOREST STREAMS FOR REARING JUVENILE CHINOOK SALMON. *Ph.D. dissertation, Univ. Idaho* 170p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(11):3954. May 1981. SFA 26(3)

81-002058 Turnpenny, A. W. H.; R. N. Bamber and P. A. Henderson. BIOLOGY OF THE SAND-SMELT (*ATHERINA PRESBYTER* VALENCIENNES) AROUND FAWLEY POWER STATION. *J. Fish Biol.* 18(4):417-427. Apr. 1981. SFA 26(3)

[Mar. Biol. Lab., Cent. Elec. Res. Lab., Fawley Power Stn., Fawley, North Southampton, England] Past studies of fish impingement at Fawley power station have shown that sand-smelts, *Atherina presbyter* Valenciennes, are susceptible to impingement and may be a useful species for examining effects of impingement mortalities on population size and structure. A 21 month study of populations in the vicinity of Fawley power station was carried out to obtain data on the biology of the species for future population dynamics modelling studies. Aspects included in the study were growth, sex ratio, reproduction, survival and mortality rates and diet. Differences in apparent and true rates of growth indicated some size-selective mortality towards younger age groups, possibly caused by the power station. A seasonally-oscillating von Bertalanffy growth equation is given to predict mean length-at-age. Most female sand-smelts (73%) matured at the end of their first year of life, fecundities ranging on average from 1394 eggs per female for I+ group fish to 6872 for III+ fish. The sex ratio was even (1 : 1). An annual survival rate of 10.8% was estimated for mature fish, and the consequent age structure of the population indicates that the bulk of egg production lies with the smaller (1+ group) fish. Since smaller fish are

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

81-002058 CONTINUED generally more vulnerable to impingement this factor may render populations sensitive to impingement mortalities. Gut content analysis indicated that sand-smelts probably actively select zooplankters from the general plankton when young and, once larger than 104 mm in length, increasingly feed upon natant macrofaunal species.

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC.

81-002059 Altuf'yev, Yu. V.; A. D. Vlasenko; A. L. Polenov and N. N. Sheveleva. ANALYSIS OF THE STATE OF THE NEUROHYPOPHYSIS AND GONADS OF THE COMMON STURGEON, *ACIPENSER GÜLDENSTÄDTI*, AND THE BELUGA, *HUSO HUSO*, BELOW THE DAM OF THE VOLGOGRAD HYDROELECTRIC POWER STATION AND IN THE "MASHKINA KOSA" OVERWINTERING DEPRESSION. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(2):94-103. 1980. SFA 26(3)
[TsNIORKh, Astrakhan, USSR]

81-002060 Altukhov, K. A. THE REPRODUCTION OF PLEURONECTIDAE IN THE WHITE SEA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(2):74-85. 1980. SFA 26(3)
[White Sea Biol. Stn., Karelian Br., USSR Acad. Sci., USSR]

81-002061 Baylis, J. R. THE EVOLUTION OF PARENTAL CARE IN FISHES, WITH REFERENCE TO DARWIN'S RULE OF MALE SEXUAL SELECTION. *Environ. Biol. Fishes* 6(2):223-251. 20 May 1981. SFA 26(3)
[Dep. Zool., Univ. Wis., Madison 53706] A simple two part hypothesis is proposed to describe the sources of selection influencing the evolution of parental care in fishes. It is derived in part from the observation that most fishes exhibiting complex patterns of parental behavior are freshwater forms. The first aspect of the hypothesis assumes that differential zygote mortality occurs in spatially and temporally varying environments. The second assumes that rates of gametogenesis are faster in males than in females. These aspects interact to generate a series of predictions: 1. When the zygote requires an external resource such as an optimal site for development, and that resource is scarce relative to the breeding population and is reusable, the male should monopolize it (male reproductive territoriality). 2. When bearing is derived from male guarding, the male will be the bearer. 3. When bearing evolves from a condition other than male guarding, the female will be favored as the bearer and the male will favored as the gamete donor. 4. In all of the above cases except male bearing, the male's reproductive success is limited primarily by the number of females he can attract rather than his own rate of gamete production and hence the male will tend to be the sexually selected sex. These and other predictions are tested against the existing literature on reproduction in fishes, and competing hypotheses are critically reviewed.

81-002062 Beniaz, K.; B. Popek and I. Szimonovič. GAMETOGENESIS AND FECUNDITY IN *TREMATOMUS BERNACCHII*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(2):134-139. 1980. SFA 26(3)
[Agric. Acad., Inst. Appl. Zool., Cracow, Poland]

81-002063 Berst, A. H.; A. R. Emery and G. R. Spangler. REPRODUCTIVE BEHAVIOR OF HYBRID CHARR (*SALVELINUS FONTINALIS* X *S. NAMAYCUSH*). *Can. J. Fish. Aquatic Sci.* 38(4):432-440. Apr. 1980. In English with

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

81-002063 CONTINUED French summ. SFA 26(3)
[Ontario Minist. Nat. Resour., Fish. Br., Box 50, Maple, ON, Canada]

81-002064 Bietz, B. F. HABITAT AVAILABLITY, SOCIAL ATTRACTION AND NEST DISTRIBUTION PATTERNS IN LONGEAR SUNFISH (*LEPOMIS MEGALOTIS PELTASTES*). *Environ. Biol. Fishes* 6(2):193-200. 20 May 1981. SFA 26(3)
[Plansearch, Inc., LAVALIN Cent., 909 5th Ave., S.W., Calgary, AB T2P 0N8, Canada] Two forces, limited availabity of preferred habitat and social attraction between conspecifics were hypothesized to explain nest aggregation in male longear sunfish. In the laboratory, males cluster their nests within a small segment of a much larger uniform area of nesting habitat. In the field, large areas of unused habitat suitable for nesting were found, suggesting that nesting aggregations are not formed as a result of limited preferred habitat. Males appear to be socially attracted during breeding, and social nesting presumably is a successful reproductive strategy for at least a portion of the population.

81-002065 Blay, J., Jr. FECUNDITY AND SPAWNING FREQUENCY OF *SAROTHERODON GALILAEUS* IN A CONCRETE POND. *Aquaculture* 25(1):95-99. July 1981. SFA 26(3)
[Inst. Aquatic Biol. (C.S.I.R.), P.O. Box 38, Achimota, Ghana] Fecundity of 26 specimens of *Sarotherodon galilaeus* cultured in a small concrete pond, 6.3 x 1.4 x 1.6 m, was determined by the "whole-count" method. The fish were not fed artificially but depended on natural phytoplankton growth, mainly *Chlorococcus* and *Chlorella*, for food. Pond water temperatures varied between 26° and 32°C. Fecundity ranged from 69 to 302 (mean = 149) for fish measuring 6.7 to 11.0cm total length with body weights of 6.2 to 22.3 g and gonad weights of 0.32 to 1.23 g. The relationships between fecundity and total length was non-linear while fecundity-body weight and fecundity-ovary weight relationships were linear. The frequency distribution of ova diameters in mature ovaries showed two separate modes representing mature and immature ova, suggesting that the species has a restricted spawning period in the pond.

81-002066 Brown, L. PATTERNS OF FEMALE CHOICE IN MOTTLED SCULPINS (*COTTIDAE, TELEOSTEI*). *Anim. Behav.* 29(2):375-382. May 1981. SFA 26(3)
[Dep. Biol., George Mason Univ., Fairfax, VA 22030] Large male sculpins (*Cottus bairdi*) breed earlier in the spawning season and mate with more females than do smaller males. These patterns are attributable to female preference for large mates, and reflect the fact that larger males make better egg guardians. Results of a computer simulation of female choice in which females mated with a male who was larger than or equal to the last male encountered are consistent with many of the observed patterns of male courtship success.

81-002067 Colgan, P. W.; W. A. Nowell and N. W. Stokes. SPATIAL ASPECTS OF NEST DEFENCE BY PUMPKINSEED SUNFISH (*LEPOMIS GIBBOSUS*): STIMULUS FEATURES AND AN APPLICATON OF CATASTROPHE THEORY. *Anim. Behav.* 29(2):433-442. May 1981. SFA 26(3)
[Dep. Biol., Queen's Univ., Kingston, ON K7L 3N6, Canada]

81-002068 Eccles, D. H. and D. S. C. Lewis. MIDWATER SPAWNING IN *HAPLOCHROMIS CHRYSONOTUS* (BOULENGER)(TELEOSTEI: CICHLIDAE) IN LAKE MALAWI. *Environ. Biol. Fishes* 6(2):201-202. 20 May 1981. SFA 26(3)

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

81-002068 CONTINUED
[Inst. Freshwater Stud., Rhodes Univ., Grahamstown 6140, South Africa] *Haplochromis chrysonotus*, a semipelagic shoaling cichlid from Lake Malawi, has been observed spawning in open water up to ten meters above the substratum. It is suggested that open water spanwing without the establishment of a substratum-based territory eliminates competition with other species for breeding space and that it may be a stage in the evolution of a totally pelagic mode of life.

81-002069 Goldberg, S. R. SEASON SPAWNING CYCLE OF THE PACIFIC BUTTERFISH, *PEPRILUS SIMILLIMUS* (STROMATEIDAE). *NOAA Fish. Bull.* 78(4):977-978. Oct. 1980. SFA 26(3)
[Dep. Biol., Whittier Coll., Whittier, CA 90608]

81-002070 Haegele, C. W.; R. D. Humphreys and A. S. Hourston. DISTRIBUTION OF EGGS BY DEPTH AND VEGETATION TYPE IN PACIFIC HERRING (*CLUPEA HARENGUS PALLASI*) SPAWNINGS IN SOUTHERN BRITISH COLUMBIA. *Can. J. Fish. Aquatic Sci.* 38(4):381-386. Apr. 1981. In English with French summ. SFA 26(3)
[Dep. Fish. Oceans, Resour. Serv. Br., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

81-002071 Idler, D. R.; S. J. Hwang; L. W. Crim. and D. Reddin. DETERMINATION OF SEXUAL MATURATION STAGES OF ATLANTIC SALMON (*SALMO SALAR*) CAPTURED AT SEA. *Can. J. Fish. Aquatic Sci.* 38(4):405-413. Apr. 1981. French summ. SFA 26(3)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

81-002072 Jones, G. P. SPAWNING-SITE CHOICE BY FEMAL *PSEUDOLABRUS CELIDOTUS* (PISCES: LABRIDAE) AND ITS INFLUENCE ON THE MATING SYSTEM. *Behav. Ecol. Sociobiol.* 8(2):129-142. Apr. 1981. SFA 26(3)
[Univ. Auckland, Mar. Res. Lab., R. D., Leigh, New Zealand]

81-002073 Jude, D. J.; S. A. Klinger and M. D. Enk. EVIDENCE OF NATURAL REPRODUCTION BY PLANTED LAKE TROUT IN LAKE MICHIGAN. *J. Great Lakes Res.* 7(1):57-61. 1981. SFA 26(3)
[Great Lakes Res. Div., Inst. Sci. Technol., Univ. Mich., Ann Arbor 48109] Lake trout (*Salvelinus namaycush*) fry were captured in southeastern Lake Michigan for the first time since the species was reintroduced from hatchery stocks in 1965. Spawning apparently occurred in fall 1979 on newly placed limestone riprap covering recently constructed power plant intake and discharge pipelines. Eggs presumably hatched in late February-March, 1980, and 57 fry (22-43 mm total length) were collected April-June, 1980, and three fry (55-62 mm) were collected in August, 1980.

81-002074 Kakuda, S. and K. Nakai. ON THE MATURITY AND SPAWNING OF *NIBEA ALBIFLORA*. *Bull. Jpn. Soc. Sci. Fish.* 47(1):17-25. Jan. 1981. SFA 26(3)
[Fac. Appl. Biol. Sci., Hiroshima Univ., Fukuyama 720, Japan] This report presents the results of a study of oogenesis, gonadial development and spawning in *N. albiflora*. The study is based on particular examinations of the ovaries and the eggs within the ovaries of the fish collected in the Seto Inland Sea. By histological study, the oogenesis of this species is fundamentally similar to that of other marine teleosts reported until now. Frequency distribution of the ova diameter of mature ovary has three modes: one is the evident mode of the ripe eggs group segregated, and the other two are the mode of maturing eggs group. Spawning occurs from late May to early August, and the height of the spawning season is in June and early July. It

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

81-002074 CONTINUED may be considered in all aspects that each fish spawns more than onve during the spawning period. Since no females less than 198 mm in standard length are found to fully mature, the biological minimum size is about 20 cm. The relationship between the fish size (L cm) in standard length and the number of ovarian eggs (N) more than 0.2 mm in diameter is indicated by the exponential equation: $N=18.02\ L^{3\cdot216}$. Furthermore, the number of eggs (N') which is shed at a single spawning by each fish may be estimated by the equation: $N'=0.9090\ L^{3\cdot581}$.

81-002075 Kimura, S. and K. Suzuki. [MATURITY AND SPAWNING OF *PARAPRISTIPOMA TRILINEATUM* IN KUMANO-NADA, CENTRAL JAPAN.] *Bull. Jpn. Soc. Sci. Fish.* 47(1):9-16. Jan. 1981. In Japanese with English summ. SFA 26(3)

[Fac. Fish., Mie Univ., Edobashi, Tsu 514, Japan] The present report deals with the fishery biology of *Parapristipoma trilineatum*, Pomadasyidae, with particular reference to maturity and spawning habits, on 1242 individuals taken from coastal areas of Kumano-nada (Kii Peninsula, central Japan) from March 1978 to August 1979. The larger half of specimens have a pair of gonads bilaterally asymmetrical in weight. Of these, the specimens with dextral gonads dominate over the specimens with sinistral ones. The development of ovarian egg proceeds uniformly throughout the ovary. The gonad index can effectively be utilized as an indicator representing the state of maturity of ovary. The index of matured female is represented as "$GI \geq 3$". The spawning takes place from June to August. The surface water temperature in the season ragned from 23°C to 28°C. The group maturity rates of female for each age group were estimated as follows: 1-age 0%; 2-age, 36.4%; 3-age, 86.2%; 4~8-ages, 100%. The biological minimum sizes were estimated at about 160 mm for both sexes. The number of ovarian eggs larger than 0.3 mm in diameter (E) was given by the following equation: $E=1.49L^{5\cdot00}/1x10^{7}$ L, fork length in mm). The estimated number of eggs spawned (Es) was obtained by the following equation: $Es=5.17\ L^{5\cdot10}/1x10^{8}$.

81-002076 Košelev, B. V. ECOMORPHOLOGICAL INVESTIGATIONS OF THE REPRODUCTION AND DEVELOPMENT OF FISHES. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 53-58. 1981. SFA 26(3)

[A.N. Severcov Inst. Evol. Anim. Morphol. Ecol., USSR Acad. Sci., Moscow, USSR]

81-002077 Lewis, R. M. and C. M. Roithmayr. SPAWNING AND SEXUAL MATURITY OF GULF MENHADEN, *BREVOORTIA PATRONUS*. *NOAA Fish. Bull.* 78(4):947-951. Oct. 1980. SFA 26(3)

[NMFS, P.O. Box 570, Beaufort, NC 28516]

81-002078 Lindquist, D. G.; J. R. Shute and P. W. Shute. SPAWNING AND NESTING BEHAVIOR OF THE WACCAMAW DARTER, *ETHEOSTOMA PERLONGUM*. *Environ. Biol. Fishes* 6(2):177-191. 20 May 1981. SFA 26(3)

[Dep. Biol., Univ. N.C., Wilmington 28406] The spawning and nesting behavior of *Etheostoma (Boleosoma) perlongum* was investigated in the field and laboratry. Sexual dimorphism is highly developed in such features as genital papillae, first dorsal and paired fins, and nuptial coloration. A reproductive migration from mid-lake to shore occurs in the spring: males precede females to select nest sites under submerged sticks and other debris. The male excavates a depression beneath the submerged object. Gonad analysis indicates a single spawning season extending from March through June. Nests were found from late April to mid-June and were guarded by a single male for

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

81-002078 CONTINUED periods of 13 to 36 days. Males initiate courtship by lateral displays, lead the female to the nest site and show the nest by inverting. The female responds by tail up, tail wag and circle; males also tail wag and circle. Spawning pairs invert, usually in unison, and orient head to head or, less often, head to tail. The female deposits eggs while holding her body in a weak S or J shape with the caudal peduncle held away from the spawning substrate while vibrating.

81-002079 Lisovenko, L. A. and M. F. Svetlov. SOME DATA ON THE BIOLOGY OF *PARALIPARIS* (FAMILY LIPARIDAE) OFF THE SOUTH SHETLANDS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):131-135. 1980. SFA 26(3)
[VNIRO, Moscow, USSR]

81-002080 Loesch, J. G. WEIGHT RELATION BETWEEN PAIRED OVARIES OF BLUEBACK HERRING. *Prog. Fish-Cult.* 43(2):77-79. Apr. 1981. SFA 26(3)
[Va. Inst. Mar. Sci., Sch. Mar. Sci., Coll. William & Mary, Gloucester Point 23062]

81-002081 Marliave, J. B. SPAWN AND LARVAE OF THE PACIFIC SANDFISH, *TRICHODON TRICHODON*. *NOAA Fish. Bull.* 78(4):959-964. Oct. 1980. SFA 26(3)
[Vancouver Public Aquarium, P.O. Box 3232, Vancouver, BC V6B 3X8, Canada]

81-002082 Moiseeva, E. B. and V. I. Rudenko. [ECOLOGICAL-PHYSIOLOGICAL PECULIARITIES OF SPAWNING OF *GOBIUS BATRACHOCEPHALUS* IN THE AQUARIUM.] *Zool. Zh.* 60(2):238-246. Feb. 1981. In Russian with English summ. SFA 26(3)
[Azov-Black Sea Res. Inst. Mar. Fish Oceanogr., Kerch, USSR] This goby may mature and spawn in the aquarium only if every fish has its own minimal territory and a definite temperature regime is maintained. The latter includes the decrease of temperature from the initial one down to 3-4° and keeping the fishes under such conditions during 2-3 weeks. The duration of cold pause determines the time of subsequent spawning. The same gobies were shown to be able to spawn with different mates during a rather long period, thus suggesting a definite lability of the reproductive system in *G. batrachocephalus* which spawns simultaneously.

81-002083 Phillips, T. D. SPAWNING SEASON OF THE BAY ANCHOVY, *ANCHOA MITCHILLI, (VALENCIENNES), IN TAMPA BAY, FLORIDA DETERMINED FROM EGG AND LARVAL SURVEYS*. *Fla. Sci.* 44(Suppl. 1):21. 1981. Abstract only. SFA 26(3)
[Mote Mar. Lab., 1600 City Island Park, Sarasota, FL 33577] Ichthyoplankton samples were collected in lower Hillsborough and upper Tampa Bays at two week intervals during 1976 and 1979. A protracted spawning period is described for the Tampa Bay anchovy population based upon the presence of eggs and early larvae from March through October during both years. Spawning began after surface water temperatures reached 20°C. Major spawning occurred during the spring and early summer months with peak egg densities observed from April through July in both 1976 and 1979. Larval densities were greatest from March through August in 1976 and from April through July in 1979. Spawning ceased by November in both years.

81-002084 Prokeš, M.; V. Baruš and J. Libosvárský. SOME RESULTS OF THE RESEARCH ON CUBAN FRESHWATER FISHES. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 101-106. 1981. SFA 26(3)
[Inst. Vert. Zool., Czech. Acad. Sci., Brno, Czechoslovakia]

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

81-002085 Ribbink, A. J.; A. C. Marsh and B. A. Marsh. NEST-BUILDING AND COMMUNAL CARE OF YOUNG BY *TILAPIA RENDALLI* DUMERIL (PISCES, CICHLIDAE) IN LAKE MALAWI. *Environ. Biol. Fishes* 6(2):219-222. 20 May 1981. SFA 26(3)
[Fish. Res. Cent., P.O. Box 27, Monkey Bay, Malawi]

81-002086 Shimizu, A. and I. Hanyu. [ANNUAL REPRODUCTIVE CYCLE OF SPRING-SPAWNING BITTERLING, *ACHEILOGNATHUS TABIRA*.] *Bull. Jpn. Soc. Sci. Fish.* 47(3):333-339. Mar. 1981. In Japanese with English summ. SFA 26(3)
[Lab. Fish Physiol., Fac. Agric., Univ. Tokyo, Bunkyo-ku, Tokyo 113, Japan]

81-002087 Shuntov, B. P.; N. A. Shurunov and V. P. Vasil'kov. PERIODICITY IN THE REPRODUCTION OF FISH FROM THE NEW ZEALAND PLATEAU BASED ON DATA FROM COMMERCIAL STATISTICS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):32-43. 1980. SFA 26(3)
[TINRO, Vladivostok, USSR]

81-002088 Suzuki, K.; Y. Tanaka; S. Hioki and S. Ueno. [SPAWNING BEHAVIOR AND EARLY LIFE HISTORY OF *HYPODYTES RUBRIPINNIS* (PISCES: CONGIOPODIDAE) IN AN AQUARIUM.] *J. Fac. Mar. Sci. Technol. Tokai Univ.* No. 14. 357-367. 1981. In Japanese with English summ. SFA 26(3)
[Fac. Mar. Sci. Technol., Tokai Univ., Japan]

81-002089 Swann, C. G. and E. M. Donaldson. BIBLIOGRAPHY OF SALMONID REPRODUCTION 1963 - 1979 FOR THE FAMILY SALMONIDAE; SUBFAMILIES SALMONINAE, COREGONINAE AND THYMALLINAE. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 970. iv + 221p. Dec. 1980. SFA 26(3)
[Dep. Fish. Oceans, 4160 Marine Dr., West Vancouver, BC V7V 1N6, Canada]

81-002090 Treasurer, J. W. SOME ASPECTS OF THE REPRODUCTIVE BIOLOGY OF PERCH *PERCA FLUVIATILIS* L. FECUNDITY, MATURATION AND SPAWNING BEHAVIOUR. *J. Fish Biol.* 18(6):729-740. June 1981. SFA 26(3)
[Grampian Health Bd., P.O. Box 91, 62 Queen's Rd., Aberdeen, Scotland] Fecundity of perch estimated from a regression of egg number on fish length varied from 6711 for a fish 14.5 cm to 77978 for a female of 34.5 cm. Other independent variables related to egg number were age, gonad weight and somatic weight. Mean egg diameter varied from 0.94 to 1.62 mm. Males matured in their second year at a length of 6 cm and above while all females spawned at age four at a length of 15-18 cm. A proportion of females at Davan spawned one year earlier than at Kinord and were also slightly smaller on spawning. Faster growth of Davan fish may have encouraged earlier maturation. Spawning behaviour is described from film material.

81-002091 Vogele, L. E. REPRODUCTION OF SMALLMOUTH BASS, *MICROPTERUS DOLOMIEUI*, IN BULL SHOALS LAKE, ARKANSAS. *U.S. Fish Wildl. Serv. Tech. Pap.* 106. 15p. 1981. SFA 26(3)
[U.S. FWS, 100 W. Rock St., Fayetteville, AR 72701] Smallmouth bass (*Micropterus dolomieui*) were studied in Bull Shoals Lake to determine the nesting requirements and reproductive capabilities of the species in a reservoir. Underwater observations were conducted weekly in five study areas during the spawning seasons of 1969-76. Spawning began as early as 3 April and as late as 27 April in different years and extended into late May or early June. Length of spawning season was affected by the rate of water temperature rise during the nesting period. Active nests were found at ambient temperatures of 13.3-22.5°C. Nests were generally on gently sloping

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

81-002091 CONTINUED rock and gravel bottoms, beside prominent objects such as rocks or sunken logs, and at densities of less than one per 100 m of shoreline. Nest depth ranged from 1.1 to 5.2 m and was usually greatest in the steepest habitat. Mean number of eggs in 10 nests was 7,757; mean number of larvae in 10 nests was 2,855. Eggs hatched in about 7 days at 14.4-15.6°C and in about 5 days at 17.8-18.6°C; larvae remained in nests for 8 days at 15.3-16.4°C and 6 days at 18.3-21.1°C; free-swimming fry were guarded by parent males for up to 4 weeks before dispersing. Ovaries of 60 females collected in five seasonal periods were examined to estimate fecundities and describe annual ovarian development cycles. Potential fecundity was estimated for 21 prespawning fish by counting all secondary-stage ova in a cross-section sample from an ovary and expanding this quantity by a gravimetric procedure. Effective fecundity was estimated by applying the percentage of ova in the most advanced modal group of ova (ovum-diameter frequency distributions were multimodal) to the estimate of potential fecundity for each specimen. Estimates of potential fecundity ranged from 3,039 to 34,896; effective fecundity ranged from 1,550 to 21,984. Fecundity was directly correlated with length, weight, and age of fish. Residual secondary-stage ova present in ovaries after spawning were resorbed during summer; primary oocytes were retained. Recrudescence of ova began in fall, and size differentation and near-maturation occurred during winter.

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC.

81-002092 Blake, L. M. MOVEMENT OF TOURNAMENT-CAUGHT AND RELEASED BASS. *N.Y. Fish Game J.* 28(1):115-117. Jan. 1981. SFA 26(3)
[N.Y. State Dep. Environ. Conserv., Watertown 13601]

81-002093 Boehlert, G. W. THE ROLE OF TEMPERATURE AND PHOTOPERIOD IN THE ONTOGENETIC MIGRATION OF PREJUVENILE *SEBASTES DIPLOPROA* (PISCES: SCORPAENIDAE). *Calif. Fish Game* 67(3):164-175. July 1981. SFA 26(3)
[Sch. Oceanogr., Oreg. State Univ., Mar. Sci. Cent., Newport, OR 97365]
Prejuvenile *Sebastes diploproa* migrate from the seasonally warm surface waters of the northwest Pacific Ocean to depths of 200 to 500 m, encountering a major change in thermal environment. To better understand the factors important in initiation and timing of the migration, temperature tolerance and thyroid follicle cell height were monitored on a seasonal basis and in fish acclimated to nine different photoperiod-temperature regimes. In field-acclimatized specimens thyroid follicle cell height was negatively correlated and temperature tolerance was positively correlated with collection temperature; no changes were noted during the migratory season. In laboratory-acclimated fish temperature tolerance and follicle cell height maintained the same relationship with acclimation temperature. Whereas temperature tolerance showed no response to photoperiod, follicles in the shortest photoperiod of acclimation (8L:16D) were characterized by hypertrophy and hyperplasia. A temperature-dependent size threshold may exist for the state of thyroid hypertrophy which appears to be related to the size threshold for migration. It is suggested that timing of the migration is controlled by rate of change of photoperiod subject to a temperature-dependent endogenous program.

81-002094 Bray, R. N. INFLUENCE OF WATER CURRENTS AND ZOOPLANKTON DENSITIES ON DAILY FORAGING MOVEMENTS OF BLACKSMITH, *CHROMIS PUNCTIPINNIS*, A PLANKTIVOROUS REEF FISH. *NOAA Fish. Bull.* 78(4):829-841. Oct. 1980. SFA 26(3)
[Dep. Biol., Calif. State Univ., Long Beach 90840]

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

81-002095 Brock, R. E. COLONIZATION OF MARINE FISHES IN A NEWLY CREATED HARBOR, HONOKOHAU, HAWAII. *Pac. Sci.* 34(3):313-326. July 1980. SFA 26(3)
[Hawaii Inst. Mar. Biol., P.O. Box 1346, Kaneohe 96744]

81-002096 Burns, K. M. TEMPORAL AND AREAL DISTRIBUTION OF SCOMBRID LARVAE IN THE VICINITY OF PALM BEACH, FLORIDA. *Fla. Sci.* 44(Suppl. 1):21. 1981. Abstract only. SFA 26(3)
[Fla. Dep. Nat. Resour., 100 8th Ave. S.E., St. Petersburg 33701]

81-002097 Coombs, S. H. and C. E. Mitchell. LONG-TERM TRENDS IN THE DISTRIBUTION, ABUNDANCE AND SEASONAL OCCURRENCE OF LARVAE OF MACKEREL (*SCOMBER SCOMBRUS* L.) AROUND THE BRITISH ISLES, 1948-1978. *J. Mar. Biol. Assoc. U.K.* 61(2):343-358. May 1981. SFA 26(3)
[Nat. Environ. Res. Council, Inst. Mar. Environ. Res., Prospect Place, The Hoe, Plymouth, England]

81-002098 Dahlberg, M. D. NEARSHORE SPATIAL DISTRIBUTION OF FISHES IN GILL NET SAMPLES, CAYUGA LAKE, NEW YORK. *J. Great Lakes Res.* 7(1):7-14. 1981. SFA 26(3)
[USDE, Pittsburg Energy Technol. Cent., P.O. Box 10940, Pittsburg, PA 15236] Cayuga Lake fishes were collected monthly with experimental gill nets at depths of 2 to 31.5 m. Horizontally-placed nets were arranged to allow determinations of vertical and inshore-offshore variation in fish distribution and occupied temperatures. Warmwater species concentrated in inshore and surface waters at 19-23°C during the summer. Coldwater species concentrated in hypolimnetic waters at 9-15°C during the summer. Seasonal inshore-offshore movements were evident with all species except those which were captured only close to shore (northern pike, carp, smallmouth bass, white sucker). Depth ranges in which greatest numbers of common species occurred in the summer (July-September) were: alewife, inshore and surface to 15.3 m; lake trout, 15.3 to 30.5 m or more; northern pike, inshore and surface to 15.3 m; rainbow smelt, 7.6 to 30.5 m or more; spottail shiner, inshore and 7.6 m; trout-perch, inshore and 7.6 to 15.3 m; yellow perch, inshore and 7.6 to 15.3 m. Mean occupied temperatures (° C) of common species during the summer were; alewife 18.4 to 20.9; lake trout, 12.5 to 13.6; northern pike, 19.4; rainbow smelt: 10.4-14.4; spottail shiner, 19.6 to 21.5; trout-perch, 18.7-21.3; yellow perch, 19.4 to 21.0. Depth distribution was obviously influenced by temperature preferences and also by availability of food in certain species. Catch size was directly related to water temperatures in several species.

81-002099 Hickey, C. R., Jr. WATER-MASS MOVEMENT AND THE MIGRATION OF STRIPED BASS AROUND EASTERN LONG ISLAND, NEW YORK. *N.Y. Fish Game J.* 28(1):108-114. Jan. 1981. SFA 26(3)
[USNRC, Environ. Eng. Br., Washington, DC 20555] A close relationship exists between the patterns of net water-mass flow and the seasonal migratory patterns of striped bass around eastern Long Island, New York. This suggests a relationship whereby striped bass may travel with the bottom water currents during their northerly spring migrations and with the surface water currents during their southerly fall migrations. The fish probably are not dependent on the currents for transport, but rather use them to their over-all advantage during migrations. Fluctuations in the character or properties of the currents could conceivably alter the spatial and temporal availability of the fish and thus the harvest. The properties of the currents might be affected by fluctuating local or regional meterological conditions.

81-002100 Jackson, P. D. MOVEMENT AND HOME RANGE OF BROWN TROUT, *SALMO TRUTTA* LINNAEUS, IN THE ABERFELDY RIVER, VICTORIA. *Aust. J. Mar. Freshwater Res.* 31(6):837-845. Dec. 1980. SFA 26(3)

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

81-002100 CONTINUED
[Fish. Wildl. Div., Arthur Rylah Inst. Environ. Res., 123 Brown St., Heidelberg, Victoria 3084, Australia] Studies of the movement of marked brown trout in a section of the Aberfeldy River between 31 January 1972 and 6 February 1974 showed that the home range of 1+ and older trout was about 60 m of river; that of 0+ fish was about 370 m. Some fish strayed outside this restricted range. The age structure of trout populations in sections of the Aberfeldy River at different times of the year suggests that 0+ fish moved up-stream into small tributaries but did not spawn there. The trout probably spawned throughout the main river.

81-002101 Kowarsky, J. and A. H. Ross. FISH MOVEMENT UPSTREAM THROUGH A CENTRAL QUEENSLAND (FITZROY RIVER) COASTAL FISHWAY. *Aust. J. Mar. Freshwater Res.* 32(1):93-109. 1981. SFA 26(3)
[Dep. Biol., West. Australia Inst. Technol., Hayman Rd., Bently, Western Australia 6102, Australia]

81-002102 Milstein, C. B. ABUNDANCE AND DISTRIBUTION OF JUVENILE *ALOSA* SPECIES OFF SOUTHERN NEW JERSEY. *Trans. Am. Fish. Soc.* 110(2):306-309. Mar. 1981. SFA 26(3)
[Ichthyological Assoc., Inc., Box 70-D, RD 1, West Brook Lane, Absecon, NJ 08201]

81-002103 Pavlov, D. S. and V. K. Nezdolij. DOWNSTREAM MIGRATIONS OF YOUNG FRESHWATER FISHES. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 89-94. 1981. SFA 26(3)
[A.N. Severcov Inst. Evol. Anim. Morphol. Ecol., USSR Acad. Sci., Moscow, USSR]

81-002104 Quinn, N. J. and B. L. Kojis. THE LACK OF CHANGES IN NOCTURNAL ESTUARINE FISH ASSEMBLAGES BETWEEN NEW AND FULL MOON PHASES IN SERPENTINE CREEK, QUEENSLAND. *Environ. Biol. Fishes* 6(2):213-218. 20 May 1981. SFA 26(3)
[Dep. Fish. Technol., Univ. Technol., P.O. Box 793, Lae, Papua New Guinea] A series of 10 sites were sampled at new and full moon phases in a vertically homogenous estuary, Serpentine Creek, Queensland, Australia. Forty-five species (14,518 individuals) were caught and analysed using standardized Shannon & Gleason diversity indices, and total number of species and individuals. The coefficients of variation for these values were greater for times than for sites. There were no significant differences between 14 pairs of new and full moon phases for $\bar{N}_t$, $\bar{S}_t$, $\bar{G}_t$, and $\bar{H}_t$, or between mean numer of individuals for the 16 most abundant species. If significant variations do exist within months, then then experiments should be done between spring and neap tides as this study found no differences between the spring tides associated with new and full moon phases.

81-002105 Riddell, B. E. and W. C. Leggett. EVIDENCE OF AN ADAPTIVE BASIS FOR GEOGRAPHIC VARIATION IN BODY MORPHOLOGY AND TIME OF DOWNSTREAM MIGRATION OF JUVENILE ATLANTIC SALMON (*SALMO SALAR*). *Can. J. Fish. Aquatic Sci.* 38(3):308-320. Mar. 1981. In English with French summ. SFA 26(3)
[Dep. Fish Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

81-002106 Rinne, J. N.; W. L. Minckley and P. O. Bersell. FACTORS INFLUENCING FISH DISTRIBITION IN TWO DESERT RESERVOIRS, CENTRAL ARIZONA. *Hydrobiologia* 80(1):31-42. 24 Apr. 1981. SFA 26(3)
[Rocky Mtn. For. Range Exp. Stn., Ariz. State Univ., Tempe 85281]

81-002107 Roper, D. S. and J. B. Jillett. SEASONAL OCCURRENCE AND DISTRIBUTION OF FLATFISH (PISCES: PLEURONECTIFORMES) IN INLETS AND SHALLOW WATER ALONG THE OTAGO COAST. *N.Z. J. Mar. Freshwater Res.* 15(1):1-13. 1981. SFA 26(3)
[Dep. Zool., Univ. Auckland, P.B., Auckland, New Zealand]

FOODS/FEEDING

81-002108 Abdel'-Malek, S. A. THE FOOD AND FEEDING INTERRELATIONSHIPS OF FISH IN LAKE QÂRÛN (EGYPT). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(2):62-66. 1980. SFA 26(3)
[VNIRO, Moscow, USSR]

81-002109 Adebisi, A. A. ANALYSES OF THE STOMACH CONTENTS OF THE PISCIVOROUS FISHES OF THE UPPER OGUN RIVER IN NIGERIA. *Hydrobiologia* 79(2):167-177. 27 Mar. 1981. SFA 26(3)
[Dep. Zool., Univ. Abadan, Ibadan, Nigeria]

81-002110 Ainley, D. G.; C. S. Strong; H. R. Huber; T. J. Lewis and S. H. Morrell. PREDATION BY SHARKS ON PINNIPEDS AT THE FARALLON ISLANDS. *NOAA Fish. Bull.* 78(4):941-945. Oct. 1980. SFA 26(3)
[Point Reyes Bird Observatory, Stinson Beach, CA 94970]

81-002111 Aksenova, Ye. I. and A. S. Mikhman. ON THE INDICES OF THE FOOD SUPPLY TO FISH. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):83-87. 1980. SFA 26(3)
[AzNIIRKh, Rostov-on-Don, USSR]

81-002112 Arawomo, G. A. O. THE FOOD OF JUVENILE TROUT, *SALMO TRUTTA* L., IN LOCH LEVEN, KINROSS, SCOTLAND. *Hydrobiologia* 79(2):105-112. 27 Mar. 1981. SFA 26(3)
[Dep. Zool., Univ. Ife, Ile-Ife, Nigeria]

81-002113 Bogdanova, L. S. THE DEVELOPMENT AND FEEDING OF THE LARVAE OF THE LAKE SYAMOZERO WHITEFISH, *COREGONUS LAVARETUS PALLASI* N. *EXILIS*, UNDER DIFFERENT TEMPERATURE CONDITIONS AND FEEDING REGIMES. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(2):66-73. 1980. SFA 26(3)
[Dep. Ichthyol. Hydrobiol., Leningrad Univ., USSR] The development, histologic structure of the digestive system and feeding intensity of larvae of the Lake Syamozero whitefish, *Coregonus lavaretus pallasi* n. *exilis*, were studied during feeding with natural live feed and 114-I artificial feed at a temperature of 11.2 and 9.6°. At 14.0° the influence of a delay by 11 and 16 days in the changeover of larvae to exogenous feeding was noted. The use of artificial feed gave no positive results; the lowering of the temperature and the delay in the changeover of larvae of exogenous feeding slowed down their growth and development.

FOODS/FEEDING (CONTINUED)

81-002114 Bowman, R. E. FOOD OF 10 SPECIES OF NORTHWEST ATLANTIC JUVENILE GROUNDFISH. *NOAA Fish. Bull.* 79(1):200-206. Jan. 1981. SFA 26(3)
[NMFS, Woods Hole, MA 02543]

81-002115 Buchanan, D. V.; R. M. Hooton and J. R. Moring. NORTHERN SQUAWFISH (*PTYCHOCHEILUS OREGONENSIS*) PREDATION ON JUVENILE SALMONIDS IN SECTIONS OF THE WILLAMETTE RIVER BASIN, OREGON. *Can. J. Fish. Aquatic Sci.* 38(3):360-364. Mar. 1981. In English with French summ. SFA 26(3)
[Oreg. Dep. Fish. Wildl., Res. Dev. Sect., Oreg. State Univ., Corvallis 97331]

81-002116 Carvalho, F. M. ALIMENTAÇÃO DO MAPARÁ (*HYPOPHTHALMUS EDENTATUS* SPIX, 1829) DO LAGO DO CASTANHO, AMAZONAS (SILURIFORMES, HYPOPHTHALMIDAE). [FEEDING OF THE MAPARA (*HYPOPHTHALMUS EDENTATUS* SPIX, 1829) IN LAKE CASTANHO, AMAZON (SILURIFORMES, HYPOPHTHALMIDAE).] *Acta Amazonica* 10(3):545-555. Sept. 1980. In Portuguese with English summ. SFA 26(3)
[Inst. Nac. Pesq. Amazonica, Manaus, Brazil]

81-002117 Clausen, D. M. SUMMER FOOD OF PACIFIC COD, *GADUS MACROCEPHALUS*, IN COASTAL WATERS OF SOUTHEASTERN ALASKA. *NOAA Fish. Bull.* 78(4):968-973. Oct. 1980. SFA 26(3)
[NMFS, P.O. Box 155, Auke Bay, AK 99821]

81-002118 Clements, W. H. and R. J. Livingston. FEEDING HABITS OF TWO SYMPATRIC SPECIES OF FILEFISH (PISCES: BALISTIDAE) OCCUPYING SEAGRASS BEDS IN APALACHEE BAY, FLORIDA. *Fla. Sci.* 44(Suppl. 1):22. 1981. Abstract only. SFA 26(3)
[Dep. Biol. Sci., Fla. State Univ., Tallahasse 32306] Analysis of stomach contents of *Monacanthus ciliatus* and *M. hispidus* revealed ontogenetic, spatial and temporal variability in feeding habits. Smaller individuals (21-30 mm) fed primarily on harpacticoid and calanoid copepods. As the fish grew, the contribution of plant material to the diet steadily increased. Larger fish also fed on gammarid amphipods and serpulid polychaetes. The diet of fish collected from heavily vegetated areas differed from the diet of fish from stations with less macrophyte biomass, suggesting a difference in prey availability between the two areas. The diet of each species was similar in terms of the major taxa. However, it is doubtful that this observed overlap in feeding habits is indicative of biological interactions owing to the non-overlapping seasonal peaks in abundance of each species, the density of available prey, and different patterns of specied-specific predation.

81-002119 Crowder, L. B.; J. J. Magnuson and S. B. Brandt. COMPLEMENTARITY IN THE USE OF FOOD AND THERMAL HABITAT BY LAKE MICHIGAN FISHES. *Can. J. Fish. Aquatic Sci.* 38(6):662-668. June 1981. In English with French summ. SFA 26(3)
[Lab. Limnol., Univ. Wis., Madison 53706]

81-002120 Farlow, J. O, Jr. NATURAL HISTORY AND ECOLOGY OF A DEMERSAL FISH-MEGABENTHIC INVERTEBRATE COMMUNITY FROM THE UPPER CONTINENTAL SLOPE OFF SOUTHERN NEW ENGLAND. *Ph.D. dissertation, Yale Univ.* 456p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(12):4346. June 1981. SFA 26(3)

81-002121 Gillen, A. L.; R. A. Stein and R. F. Carline. PREDATION BY PELLET-REARED TIGER MUSKELLUNGE ON MINNOWS AND BLUEGILLS IN EXPERIMENTAL SYSTEMS. *Trans. Am. Fish. Soc.* 110(2):197-209. Mar. 1981. SFA 26(3)
[Ohio Coop. Fish. Res. Unit, 1735 Neil Ave., Columbus 43210]

FOODS/FEEDING (CONTINUED)

81-002122 Gorelova, T. A. and V. B. Tseytlin. FEEDING OF MESOPELAGIC FISH OF THE GENUS *CYCLOTHONE*. *Oceanology* 19(6):736-739. June 1979. SFA 26(3)

[P.P. Shirshov Inst. Oceanol., USSR Acad. Sci., Moscow, USSR] The quantitative feeding characteristics of four abundant *Cyclothone* species from the tropical parts of the Pacific and Atlantic Oceans have been investigated. The specific daily rations (Rd/W) of these fish were estimated from the known stomach filling indices of the fish under natural conditions and from the digestion time calculated for these conditions. These daily rations amounts to 0.4-2%. Some characteristics having the greatest effect on magnitude of the daily ration, such as the fraction of fish with food in their stomach, the average weight of the prey, and digestion time are analyzed.

81-002123 Hennig, R. and C. D. Zander. ZUR BIOLOGIE UND NAHRUNG VON KLEINFISCHEN DES NORDUND OSTSEE-BEREICHS. III. DIE BESIEDLUNG EINES SÜßWASSERWATTS DER ELBE DURCH EURYHALINE FISCHE. [ON THE BIOLOGY AND FOOD OF SMALL-SIZED FISH FROM THE NORTH AND BALTIC SEA AREA. III. THE COLONIZATION OF A FRESHWATER MUD FLAT OF THE ELBE RIVER BY EURYHALINE FISH.] *Arch. Hydrobiol. Supplementb.* 43(4):487-505. 1981. In German with English summ. SFA 26(3)

[Neukoppel 14a, 2000 Hamburg 62, West Germany] In 1976, an investigation was made of four small-sized fish species inhabiting the freshwater mud flat called "Fährmannssand" near Hamburg. These species, *Anguilla anguilla* (elvers), *Gasterosteus aculeatus* and *Pungitius pungitius* (sticklebacks), and *Pomatoschistus microps* (young common gobies), are extremely euryhaline. The largest benthic macro- and meiofauna components were oliogochaetes, but only the eels fed on them in large quantities. The sticklebacks consumed mainly cyclopoids or cladocerans; the gobies, harpacticoids and cyclopoids. Although fewer chironomid larvae than copepods are consumed, this diet component equal the copepods in biomass. The trophic niches of the four fish species only partially overlap: the eels prefer endobenthic components rather than epi- and suprabenthic ones, which are the main food for sticklebacks and gobies, which do not compete because they inhabit the biotope at different times.

81-002124 Iwama, G. K. and A. F. Tautz. A SIMPLE GROWTH MODEL FOR SALMONIDS IN HATCHERIES. *Can. J. Fish. Aquatic Sci.* 38(6):649-656. June 1981. In English with French summ. SFA 26(3)

[Ontario Minist. Nat. Resour., Whitney Block, Queen's Park, Toronto, ON M7A 1W3, Canada]

81-002125 Johnson, J. H. FOOD INTERRELATIONSHIPS OF COEXISTING BROOK TROUT, BROWN TROUT AND YEARLING RAINBOW TROUT IN TRIBUTARIES OF THE SALMON RIVER, NEW YORK. *N.Y. Fish Game J.* 28(1):88-99. Jan. 1981. SFA 26(3)

[N.Y. State Dep. Environ. Conserv., 50 Wolf Rd., Albany 12233] A total of 267 overyearling salmonids from four tributaries of the Salmon River were examined for diet composition from June through September during 1977-1979. The specimens were grouped in six categories, i.e., wild yearling rainbow trout, yearling rainbow trout of hatchery origin, large brown trout, small brown trout, large brook trout and small brook trout. Terrestrial annelids, trichopterans, semi-aquatic vertebrates and decapods comprised the major food of wild rainbow trout, while hatchery fish fed most heavily on trichopterans and decapods. Large brown trout fed principally on decapods, subyearling coho salmon and rainbow trout, and frogs, while small brown trout relied chiefly on decapods. Fish were the primary prey of large brook trout, while trichopterans were important in the diet of both large and small brook trout.

FOODS/FEEDING (CONTINUED)

81-002125 CONTINUED Size of the predator appears to be an important factor in both inter- and intraspecific food choice for resident brook trout and brown trout. The diet of hatchery rainbow trout was found to overlap significantly those of small brook trout and small brown trout but not that of wild rainbow trout.

81-002126 Johnson, J. H. and N. H. Ringler. PREDATION ON IMMATURE MIDGES BY RECENTLY EMERGED COHO SALMON. *N.Y. Fish Game J.* 28(1):121. Jan. 1981. SFA 26(3)
[N.Y. State Dep. Environ. Conserv., Albany 12233]

81-002127 Kohler, C. C. and J. J. Ney. CONSEQUENCES OF AN ALEWIFE DIE-OFF TO FISH AND ZOOPLANKTON IN A RESERVOIR. *Trans. Am. Fish. Soc.* 110(3):360-369. May 1981. SFA 26(3)
[Fish. Res. Lab., South. Ill. Univ., Carbondale 63901]

81-002128 Kokeš, J. THE FOOD OF JUVENILE BROWN TROUT (*SALMO TRUTTA* M. *FARIO*) IN TWO STREAMS OF THE BĚLÁ RIVER CATCHMENT AREA. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 47-51. 1981. SFA 26(3)
[Inst. Vert. Zool., Czech. Acad. Sci., Brno, Czechoslovakia]

81-002129 Koslow, J. A. FEEDING SELECTIVITY OF SCHOOLS OF NORTHERN ANCHOVY, *ENGRAULIS MORDAX*, IN THE SOUTHERN CALIFORNIA BIGHT. *NOAA Fish. Bull.* 79(1):131-142. Jan. 1981. SFA 26(3)
[Dep. Oceanogr., Dalhousie Univ., Halifax, NS B3H 4J1, Canada] Direct field measurements of the feeding of five schools of northern anchovy over four sets of conditions indicate consistent size-selective feeding on the dominant zooplankton taxa. At low-to-moderate prey concentrations (10-40 mg carbon per cubic meter), the schools consumed 35-50% of the total zooplankton biomass and >90% of the largest zooplankters present. The schools' feeding was a positive function of preysize primarily. The density of particular prey items did not significantly affect feeding selectivity. The northern anchovy fed preferentially upon a particular species in only one instance. No significant difference was found in the selectivity of two northern anchovy schools composed primarily of late 0-group and II-group fish, respectively, that were feeding under similar feeding conditions. At prey concentrations of 10-40 mg carbon per cubic meter, the degree of selectivity was inversely related to the size of the largest prey available. The prey size at which consumption is predicted to be 100% was proportional to the size of the largest prey.

81-002130 Kukuk, P. F. HOW VERTEBRATES SEARCH FOR SMALL PREY. *Ph.D. dissertation, Univ. Kans.* 158p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(12):4355. June 1981. SFA 26(3)

81-002131 Kuznetsov, Ye. A. THE EFFECT OF FISH WITH DIFFERENT FEEDING HABITS ON THE DEVELOPOMENT OF PLANKTONIC BACTERIA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):87-98. 1980. SFA 26(3)
[Dep. Plant Physiol., Moscow Univ., USSR] A study of bacterioplankton in fish rearing ponds with intensive polyculture, and laboratory experiments have shown that the introduction into the aquatic ecosystem of fish increases the abundance of bacteria in the water. With the presence of the carp, *Cyprinus carpio*, and the grass carp, *Ctenopharyngodon*, the abundance of bacteria varies strongly, and the drying off of bacteria is prevalent. With the presence of the silver carp, *Hypophthalmichthys molitrix*, the abundance of bacteria increases to 18-25 million cells/ml and is stabilized at this level by the constant consumption of planktonic bacteria by the

FOODS/FEEDING (CONTINUED)

81-002131 CONTINUED silver carp, the rate of reproduction remains high, causing accelerated mineralization of the metabolic products of fish and other aquatic organisms. The ecosystem of a pond with a polyculture of filter-feeding fish becomes more stable than the ecosystem of a pond with carp monoculture.

81-002132 Malyshev, V. I. EVALUATION OF THE FOOD REQUIREMENTS OF THE NORTH SEA WHITING, *ODONTOGADUS MERLANGUS*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):68-74. 1980. SFA 26(3)
[AtlanticNIRO, Kaliningrad, USSR] The food of the North Sea whiting, *Odontogadus merlangus* was examined. It was found that fish constitute the bulk of its food. The daily and annual rations are calculated, and the value of the latter is 478% of the weight of the fish, or 819 large calories. The amount of food consumed by the entire North Sea whiting population in one year is calculated; it amonts to 2.2 million tons.

81-002133 Markovtsev, V. G. THE FEEDING OF THE "KOREAN SAWBELLY" *HEMICULTER EIGENMANNI*, IN LAKE KHANKA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):136-138. 1980. SFA 26(3)
[TINRO, Vladivostok, USSR]

81-002134 Neilson, J. D. and G. H. Green. METHOD FOR PREPARING OTOLITHS FOR MICROSTRUCTURE EXAMINATION. *Prog. Fish-Cult.* 43(2):90-91. Apr. 1981. SFA 26(3)
[Dep. Biol. Sci., Simon Fraser Univ., Burnaby, BC V5A 1S6, Canada]

81-002135 Olenick, R. J. and J. H. Gee. TIGER SALAMANDERS (*AMBYSTOMA TIGRINUM*) AND STOCKED RAINBOW TROUT (*SALMO GAIRDNERI*): POTENTIAL COMPETITORS FOR FOOD IN MANITOBA PRAIRIE POTHOLE LAKES. *Can. Field-Nat.* 95(2):129-132. Apr.-June 1981. SFA 26(3)
[Inst. Anim. Resour. Ecol., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada] Tiger Salamanders (*Ambystoma tigrinum*) were aquatic and coexisted with Rainbow Trout (*Salmo gairdneri*) from May until early August, the first half of the trout growing season, in two Manitoba pothole lakes. Salamanders were benthic and ate (*Gammarus* almost exclusively. Trout were mainly limnetic and in May-June consumed mainly *Chaoborus* larvae and *Gammarus*, switching almost entirely to *Gammarus* in July and August. The considerable overlap in diet and only partial segregation in time (season) and space indicate a potential for competition for food. This is probably minimized by differences in mouth size and the plasticity of feeding by trout.

81-002136 Peters, D. S. and W. E. Schaaf. FOOD REQUIREMENTS AND SOURCES FOR JUVENILE ATLANTIC MENHADEN. *Trans. Am. Fish. Soc.* 110(3):317-324. May 1981. SFA 26(3)
[NMFS, Beaufort, NC 28516]

81-002137 Peterson, M. S.; T. W. Roberts and R. G. Gilmore. THE FEEDING ECOLOGY OF GERREID FISHES. *Fla. Sci.* 44(Suppl. 1):22. 1981. Abstract only. SFA 26(3)
[Fla. Inst. Technol., Box 1150, Melbourne 32901] The feeding habits of 5 species of gerreids from the Indian River lagoon were examined over a 6 month period. Two ecologically distinct habitats were chosen: a mixed seagrass bed and an inlet channel beach, both located near Sebastian Inlet, Florida. The silver jenny *Eucinostomus gula*, spotfin mojarra *E. melanopterus* utilize inlet resources. The two groups are principally allopatric in distribution, with the seagrass species feeding mostly on calanoid copepods and polychaetes and the inlet species feeding primarily on bivalves and amphipods. Interspecific, intraspecific, seasonal, and diel variations in feeding were examined.

FOODS/FEEDING (CONTINUED)

81-002137 CONTINUED

81-002138 Pierce, R. J.; T. E. Wissing and B. A. Megrey. ASPECTS OF THE FEEDING ECOLOGY OF GIZZARD SHAD IN ACTON LAKE, OHIO. *Trans. Am. Fish. Soc.* 110(3):391-395. May 1981. SFA 26(3)
[NADPL-R, U.S. Army Corps Eng., 90 Church St., New York, NY 10007]

81-002139 Purcell, J. E. FEEDING ECOLOGY OF *RHIZOPHYSA EYSENHARDTI*, A SIPHONOPHORE PREDATOR OF FISH LARVAE. *Limnol. Oceanogr.* 26(3):424-432. May 1981. SFA 26(3)
[Woods Hole Oceanogr. Inst., Woods Hole, MA 02543]

81-002140 Quammen, M. L. THE IMPACT OF PREDATION BY SHOREBIRDS, BENTHIC FEEDING FISH AND A CRAB ON THE SHALLOW LIVING INVERTEBRATES IN INTERTIDAL MUDFLATS OF TWO SOUTHERN CALIFORNIA LAGOONS. *Ph.D. dissertation, Univ. Calif. (Irvine)* 146p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(10):3677. Apr. 1981. SFA 26(3)

81-002141 Rajasilta, M. FOOD CONSUMPTION OF THE THREE-SPINED STICKLEBACK (*GASTEROSTEUS ACULEATUS* L.). *Ann. Zool. Fenn.* 17(2):123-126. 1980. SFA 26(3)
[Archipelago Res. Inst., Univ. Turku, SF-20500 Turku 50, Finland] The daily food consumption of the three-spined stickleback at different temperatures was calculated from determinations of the rate of digestion. The rate of digestion in fish which had taken food in the sea before being caught was compared with that of fish fed in the laboratory either with *Daphnia* or with plankton collected from the sea. Owing to seasonal differences in the food available in nature, determination of the digestion rate in fish that had taken food under natural conditions was found to give a better estimate of the actual food consumption of the three-spined stickleback than feeding experiments. In fish averaging 1.0 g fr. wt. the daily food consumption so calculated was 24.2±7.8 mg (2.4% of the body fr. wt.) at 10°C, 48.3±16.3 mg (4.8%) at 14°C, and 132.8±28.8 mg (13.3%) at 18°C. In fish averaging 1.6 g the respective rates were 100.2±39.7 mg (6.2%), 186.2±50.4 mg (11.6%) and 271.2±50.4 mg (16.9%).

81-002142 Spanovskaya, V. D.; V. A. Girgorash, T. V. Lebedeva and V. A. Rekubratskiy. ON THE DYNAMICS OF FEEDING OF YOUNG FISH FROM MOZHAYSK RESERVOIR IN VARIOUS YEARS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):74-83. 1980. SFA 26(3)
[Dep. Ichthyol., Moscow Univ., USSR]

81-002143 Sponder, D. L. and G. V. Lauder. TERRESTRIAL FEEDING IN THE MUDSKIPPER *PERIOPHTHALMUS* (PISCES: TELEOSTEI): A CINERADIOGRAPHIC ANALYSIS. *J. Zool. (Lond.)* 193(4):517-530. Apr. 1981. SFA 26(3)
[Dep. Anat., Univ. Chicago, 1025 E. 57th St., Chicago, IL 60637]

81-002144 Teska, J. D. and D. J. Behmer. ZOOPLANKTON PREFERENCE OF LARVAL LAKE WHITEFISH. *Trans. Am. Fish. Soc.* 110(3):459-461. May 1981. SFA 26(3)
[Biol. Dep., Lake Superior State Coll., Sault Ste. Marie, MI 49783]

81-002145 Vesin, J.-P.; W. C. Leggett and K. W. Able. FEEDING ECOLOGY OF CAPELIN (*MALLOTUS VILLOSUS*) IN THE ESTUARY AND WESTERN GULF OF ST. LAWRENCE AND ITS MULTISPECIES IMPLICATIONS. *Can. J. Fish. Aquatic Sci.*

FOODS/FEEDING (CONTINUED)

81-002145 CONTINUED 38(3):257-267. Mar. 1981. In English with French summ. SFA 26(3)
[Dep. Biol., McGill Univ., 1205 Ave. Docteur Penfield, Montreal, PQ H3A 1B1, Canada]

81-002146 Wańkowski, J. W. J. BEHAVIOURAL ASPECTS OF PREDATION BY JUVENILE ATLANTIC SALMON (*SALMO SALAR* L.) ON PARTICULATE, DRIFTING PREY. *Anim. Behav.* 29(2):557-571. May 1981. SFA 26(3)
[Dep. Agric. Fish. Scotland, Freshwater Fish. Lab., Faskally, Pitlochry, Scotland] A recirculatory flume tank simulating a simplified stream environment was used to study the feeding behaviour of juvenile Atlantic salmon (*Salmo salar* L.), 5.1 to 9.4 cm in fork length (from tip of snout to fork of tail), on artificial particulate prey passively drifting in the water current. Changes in feeding behaviour at two different times of the year and when fish were presented with prey of different sizes are described and quantified. Responsiveness to food was greatly reduced in autumn as compared to summer. The maximum distances at which prey elicited a response decreased in autumn to 40% of the summer value, and the maximum distances which fish traversed in order to capture prey decreased by 80% over the same period. During the peak growing season, the response to a range of prey sizes from 0.013 to 0.102 x fish fork length was directly related to prey size and could be accounted for on the basis of visual theory alone. Capture distances were closely related to fixation distances. Maximum capture distance increased to a peak value for prey of between 0.025 and 0.069 x fork length, while larger prey were never captured and the smallest prey rarely evoked a response. Prey size selectivity also operated after capture, through rejection versus retention of the prey.

81-002147 Watkins, C. E.; J. V. Shireman; R. W. Rottmann and D. E. Colle. FOOD HABITS OF FINGERLING GRASS CARP. *Prog. Fish-Cult.* 43(2):95-97. Apr. 1981. SFA 26(3)
[Aquatic Plant Res. Cent., Univ. Fla., Gainesville 32611]

81-002148 Werme, C. E. RESOURCE PARTITIONING IN A SALT MARSH FISH COMMUNITY. *Ph.D. dissertation, Boston Univ. Grad. Sch.* 148p. 1981. From Diss. Abstr. Int. B Sci. Eng. 41(12):4374. June 1981. SFA 26(3)

81-002149 Werner, E. E.; G. G. Mittelbach and D. J. Hall. THE ROLE OF FORAGING PROFITABILITY AND EXPERIENCE IN HABITAT USE BY THE BLUEGILL SUNFISH. *Ecology* 62(1):116-125. Feb. 1981. SFA 26(3)
[W. K. Kellogg Biol. Stn., Mich. State Univ., Hickory Corners 49060] This study integrates laboratory and field results to interpret habitat use and switching by individual bluegill sunfish (*Lepomis macrochirus*). Prey handling and search times for the bluegill were determined from laboratory feeding experiments at different prey sizes and densities in open water and sediment habitats. Relationships were then constructed to predict the expected return per unit time foraging in these habitats. Experience (learning) was found to increase foraging efficiency up to fourfold over the course of six to eight foraging bouts. A population of 225 bluegills was then introduced into a pond consisting predominantly of open water and sediment habitats. This population exhibited several habitat switches as resources declined during the 3-mo experiment; in addition, the population split over a 5-wk period, with individuals specializing on one habitat or the other. These specialists were considerably more successful than habitat generalists as measured by average amount of food in the stomachs. Return rates estimated from the laboratory experiments indicated that the two habitats were nearly equal in foraging profitability. The individual specialization indicated that learning and mutually interfering foraging mechanisms were involved in the species' use of the two habitats. The results suggest that learning and sampling are important aspects of both habitat use and the specialization of individuals within a population.

AGE AND GROWTH

81-002150 Beamish, R. J. USE OF FIN-RAY SECTIONS TO AGE WALLEYE POLLOCK, PACIFIC COD, AND ALBACORE, AND THE IMPORTANCE OF THE METHOD. *Trans. Am. Fish. Soc.* 110(2):287-299. Mar. 1981. SFA 26(3)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

81-002151 Blake, C. and B. F. Blake. AGE DETERMINATION IN SIX SPECIES OF FISH FROM A MEXICAN PACIFIC COASTAL LAGOON. *J. Fish Biol.* 18(4):471-478. Apr. 1981. SFA 26(3)
[Rowan Cottage, Inveramsay, Inverurie, Aberdeenshire, Scotland] Check marks were found on the scales of *Cynoscion xanthulus* Jordan & Gilbert, *Pomadasys macracanthus* (Günther), *Elops affinis* Regan, *Centropomus nigrescens* Günther, *Micropogon ectenes* Jordan & Gilbert and *Chanos chanos* (Forskål). Corresponding marks were also found on the opercular bones of *P. macracanthus* and *C. chanos*. One check per year was formed in all species during the time of the rains (July-October) and in *Chanos chanos, Cynoscion xanthulus* and *Micropogon ectenes* a further check was formed during February-March. Back-calculations of length were possible from the scales and where opercular bones were also used back-calculated lengths were similar to estimations from the scales. The formation of check marks is discussed in relation to annual changes in environmental conditions.

81-002152 Clark, W. G. RESTRICTED LEAST-SQUARES ESTIMATES OF AGE COMPOSITION FROM LENGTH COMPOSITION. *Can. J. Fish. Aquatic Sci.* 38(3):297-307. Mar. 1981. In English with French summ. SFA 26(3)
[Coll. Fish., Univ. Wash., Seattle 98195]

81-002153 Cox, D. K. and C. C. Coutant. GROWTH DYNAMICS OF JUVENILE STRIPED BASS AS FUNCTIONS OF TEMPERATURE AND RATION. *Trans. Am. Fish. Soc.* 110(2):226-238. Mar. 1981. SFA 26(3)
[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

81-002154 Francis, M. P. AGE AND GROWTH OF MOKI, *LATRIDOPSIS CILIARIS* (TELEOSTEI: LATRIDAE). *N.Z. J. Mar. Freshwater Res.* 15(1):47-49. 1981. SFA 26(3)
[Dep. Zool., Univ. Canterbury, Christchurch I, New Zealand] *Latridopsis ciliaris* from Kaikoura, New Zealand, were aged by counting hyaline rings on their otoliths. Otoliths were prepared by breaking, grinding, and burning. Commercial catches of *L. ciliaris* were sampled for length-frequency distribution at Kaikoura and Gisborne to determine length (and, indirectly, age) at first recruitment and full recruitment. Size at sexual maturity was determined by examination of gonads. *L. ciliaris* reached sexual maturity at a fork length of about 40 cm and an age of 5-6 years. They first recruit to commercial fisheries at a length of 40-44 cm and an age of 5-6 years; full recruitment is attained at a length of 60 cm and an age of 8-10 years. The rate of growth declines markedly at about the time the fish join the migratory adult schools. *L. ciliaris* grow to at least 80 cm fork length and reach an age of 33 years.

81-002155 Frost, K. J. and L. F. Lowry. TROPHIC IMPORTANCE OF SOME MARINE GADIDS IN NORTHERN ALASKA AND THEIR BODY-OTOLITH SIZE RELATIONSHIPS. *NOAA Fish. Bull.* 79(1):187-192. Jan. 1981. SFA 26(3)
[Alaska Dep. Fish Game, 1300 College Rd., Fairbanks 99701]

AGE AND GROWTH (CONTINUED)

81-002156 Kazakov, R. V. RELATION BETWEEN SIZES OF ADULT ATLANTIC SALMON (*SALMO SALAR* L.) AND DURATION OF RIVER AND SEA-LIFE PERIODS. *Aquaculture* 24(3-4):327-340. June 1981. SFA 26(3)

[GOSNIORKh, Makarova Embankment 26, Leningrad, USSR] The author has analyzed data on more than 2500 fish studied over 8 successive years and has concluded that there is no regular, positive influence of the length of the river-life period on the size of adult salmon returnig for spawning. The data presented indicate that an influence (not statistically significant) of length of the river-life period on further growth of salmon can be shown only in fish returning for spawning after minimal periods of sea feeding (males 1+ years, females 2+ years of sea life).

81-002157 McCaughran, D. A. ESTIMATING GROWTH PARAMETERS FOR PACIFIC HALIBUT FROM MARK-RECAPTURE DATA. *Can. J. Fish. Aquatic Sci.* 38(4):394-398. Apr. 1981. In English with French summ. SFA 26(3)

[Int. Pac. Halibut Comm., P.O. Box 5009, University Stn., Seattle, WA 98105]

81-002158 Shirvell, C. S. VALIDITY OF FIN-RAY AGEING FOR BROWN TROUT. *J. Fish Biol.* 18(4):377-383. Apr. 1981. SFA 26(3)

[Fish. Oceans, P.O. Box 550, Halifax, NS B3J 2S7, Canada] Ageing of brown trout from their fin rays is a valid method. Fin-ray ages agreed with length-frequency ages 84% of the time during the year, but agreement was only 66% during annulus formation (October-December) compared with 94% during the rest of the year. The seasonal record of the annulus at the edge of the ray only weakly validated the technique, but this was caused by difficulty in distinguishing the winter growth band when it was outermost on the ray. The first annulus was usually not apparent in older fish; this could cause systematic underageing. Ageing from fin rays should be assessed prior to use in each situation.

81-002159 Townsend, D. W. and J. J. Graham. GROWTH AND AGE STRUCTURE OF LARVAL ATLANTIC HERRING, *CLUPEA HARENGUS HARENGUS*, IN THE SHEEPSCOT RIVER ESTUARY, MAINE, AS DETERMINED BY DAILY GROWTH INCREMENTS IN OTOLITHS. *NOAA Fish. Bull.* 79(1):123-130. Jan. 1981. SFA 26(3)

[Dep. Oceanogr., Univ. Me., Ira C. Darling Cent., Walpole 04573] Larval Atlantic herring, *Clupea harengus harengus*, were sampled in the Sheepscot River estuary, Maine, using both towed, and buoyed and anchored plankton nets from October 1978 to March 1979, to determine growth rates and age structure. Larval densities and length-frequency distributions, determined from the buoyed and anchored net samples, and the ages of larvae captured in the towed nets, as determined by daily growth increments in the otoliths, showed that there were at least two normally distributed age-groups of larvae which entered the estuary in November and December. The two groups hatched during early October and late November, and each appeared in the estuary when about 4 weeks old. Each of the two age-groups of larvae experienced a reduction in growth rate during the latter half of January and early February. The older of the two groups grew approximately 2.1 mm per week from October to early January and from late February to early March. These older larvae grew little if any, during the midwinter period. The younger of the two groups of larvae showed a similar reduction in growth rate during midwinter and grew about 2.0 mm per week before and about 1.5 mm per week after this period.

81-002160 Tsimenidis, N. C. and J. C. Ondrias. GROWTH STUDIES ON THE ANGLER-FISHES *LOPHIUS PISCATORIUS* L., 1758 AND *LOPHIUS BUDEGASSA* SPINOLA, 1807 IN GREEK WATERS. *Thalassographica* 3(2):63-94. Dec. 1980. SFA 26(3)

[Inst. Oceanogr. Fish. Res., Athens, Greece] Age, rate of growth and length-weight relationships of the angler-fish *L. budegassa* collected

AGE AND GROWTH (CONTINUED)

81-002160 CONTINUED from Saronikos Gulf in 1975-1977 and *L. piscatorius* collected from four areas in the Aegean Sea in 1976-1979 were studied. Age was determined from otoliths which were read whole immersed in creosote under a binocular microscope with reflected light. Annual growth in length was studied by backalculating on the basis of otolith radius-body length relationships. It was established that *L. piscatorius* grow much faster than *L. budegassa*. Growth in weight was determined by applying the length-weight relationships to the mean length-at-age data. In both species females were heavier for their length and age group than males.

81-002161 Uchiyama, J. H. and P. Struhsaker. AGE AND GROWTH OF SKIPJACK TUNA, *KATSUWONUS PELAMIS*, AND YELLOWFIN TUNA, *THUNNUS ALBACARES*, AS INDICATED BY DAILY GROWTH INCREMENTS OF SAGITTAE. *NOAA Fish. Bull.* 79(1):151-162. Jan. 1981. SFA 26(3)
[NMFS, Honolulu, HI 96812]

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC.

81-002162 Allen, G. R. and J. E. Randall. A REVIEW OF THE DAMSELFISHES (TELEOSTEI: POMACENTRIDAE) OF THE RED SEA. *Isr. J. Zool.* 29(1-3):1-98. 1980. SFA 26(3)
[Dep. Fish., West. Aust. Mus., Perth, Australia 6000]

81-002163 Belyanina, T. N. CODLETS (BREGMACEROTIDAE, OSTEICHTHYES) OF THE CARIBBEAN SEA AND THE GULF OF MEXICO. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):138-141. 1980. SFA 26(3)
[Inst. Oceanol., USSR Acad. Sci., Moscow, USSR]

81-002164 Blacker, R. W. RECENT OCCURRENCES OF BLUE WHITING, *MICROMESISTIUS POUTASSOU*, AND NORWAY POUT, *TRISOPTERUS ESMARKII*, IN THE ENGLISH CHANNEL AND SOUTHERN NORTH SEA. *J. Mar. Biol. Assoc. U.K.* 61(2):307-313. May 1981. SFA 26(3)
[Minist. Agric. Fish. Food, Fish. Lab., Lowestoft, Suffolk, England]

81-002165 Blanchet, R. H. DISTRIBUTION AND ABUNDANCE OF ICHTHYOPLANKTON IN APALACHICOLA BAY, FLORIDA IN 1974. *Fla. Sci.* 44(Suppl. 1):21. 1981. Abstract only. SFA 26(3)
[Mote Mar. Lab., 1600 City Island Park, Sarasota, FL 33577]

81-002166 Borkin, I. V. and M. S. Shevelev. THE NORTHERN LANTERNFISH, *BENTHOSEMA GLACIALE* (MYCTOPHIDAE), OFF NOVAYA ZEMLYA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(2):129-130. 1980. SFA 26(3)
[PINRO, Murmansk, USSR]

81-002167 Cooper, C. L.; W. C. Bartholomew; C. E. Herdendorf; J. M. Reutter and F. L. Snyder. LIMNETIC LARVAL FISH OF THE MAUMEE AND SANDUSKY RIVER ESTUARIES. *J. Great Lakes Res.* 7(1):51-54. 1981. SFA 26(3)
[Cent. Lake Erie Area Res., Ohio State Univ., Columbus 43210]

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

81-002168 Dovel, W. L. ICHTHYOPLANKTON OF THE LOWER HUDSON ESUTARY, NEW YORK. *N.Y. Fish Game J.* 28(1):21-39. Jan. 1981. SFA 26(3)
[Oceanic Soc., Stamford, CT]

81-002169 Edwards, A. and R. Lubbock. A NEW WRASSE (TELEOSTEI: LABRIDAE) OF THE GENUS *XYRICHTYS* FROM THE FERNANDO DE NORONHA ARCHIPELAGO. *Rev. Suisse Zool.* 88(1):233-237. 1981. SFA 26(3)
[Dove Mar. Lab., Cullercoats, North Shields, Tyne and Wear, NE30 4PZ, U.K.]

81-002170 Elser, A. A.; Gorges, M. W. and L. M. Morris. DISTRIBUTION OF FISHES IN SOUTHEASTERN MONTANA. *Proc. Mont. Acad. Sci.* 40:44. 1981. Abstract only. SFA 26(3)
[Bur. Land Manage., Box 940, Miles City, MT 59301]

81-002171 Emery, L. RANGE EXTENSION OF PINK SALMON (*ONCORHYNCHUS GORBUSCHA*) INTO THE LOWER GREAT LAKES. *Fisheries (Bull. Am. Fish. Soc.)* 6(2):7-10. Mar.-Apr. 1981. SFA 26(3)
[Natl. Fish. Cent., Rt. 3, Box 40 G, Kearneysville, WV 25430]

81-002172 Flain, M. DISTRIBUTION OF QUINNAT SALMON, *ONCORHYNCHUS TSHAWYTSCHA*, OFF THE EAST COAST OF THE SOUTH ISLAND, 1925-78. *N.Z. J. Mar. Freshwater Res.* 15(1):21-24. 1981. SFA 26(3)
[Fish. Res. Div., Minist. Agric. Fish., P.B., Christchurch, New Zealand]

81-002173 Goren, M. and Z. Voldarsky. *PARAGOBIODON XANTHOSOMA* (BLEEKER) NEW FOR THE RED SEA (PISCES: GOBIIDAE). *Isr. J. Zool.* 29(1-3):150-152. 1980. SFA 26(3)
[Dep. Zool., Tel Aviv Univ., Tel Aviv, Israel]

81-002174 Gould, W. R. FIRST RECORDS OF THE RAINBOW SMELT (OSMERIDAE) SICKLEFIN CHUB (CYPRINIDAE) AND WHITE BASS (PERCICHTHYIDAE) FROM MONTANA. *Proc. Mont. Acad. Sci.* 40:9-10. 1981. SFA 26(3)
[Coop. Fish. Res. Unit, Mont. State Univ., Bozeman 59717]

81-002175 Greenberg, L. A. and S. Steigerwald. NEW DISTRIBUTIONAL RECORD FOR *ETHEOSTOMA SAGITTA* IN KENTUCKY. *Trans. Ky. Acad. Sci.* 42(1-2):37. Mar. 1981. SFA 26(3)
[Ecol. Syst., Langmuir Lab., Cornell Univ., Ithaca, NY 14850]

81-002176 Hamann, I.; H.-Ch. John and E. Mittelstaedt. HYDROGRAHY AND ITS EFFECT ON FISH LARVAE IN THE MAURITANIAN UPWELLING AREA. *Deep-Sea Res. A Oceanogr. Res. Pap.* 28(6):561-575. June 1981. SFA 26(3)
[Deutsches Hydrograph. Inst., Bernhard-Nocht-Strasse 78, 2000 Hamburg 4, West Germany] During *Meteor* cruise 44 in January and February 1977 simultaneous hydrographical and biological investigations were carried out in the Mauritanian upwelling area. Both horizontally and vertically the hydrographic structure and fish larvae abundance were similar, apparently results of upwelling. Highest concentrations of fish larvae were found above the slope and above the outer shelf in aged upwelled water, whilst fresh upwelling water was free of larvae. The inshore boundary of fish larvae followed approximately the 16°C isotherm. Both hydrography and fish larvae populations at a given location varied in time, consequences of advection. A spatial and temporal investigation of species composition indicated that during upwelling fish larvae were carried from depths of about 30m at the outer shelf towards the shore and northward. This pathway was also indicated by water mass analysis and current meter measurements. Within the upper 60m the northward flow, however, decreased with increasing latitude. According

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

81-002176 CONTINUED to water mass analysis and species distribution there was no northward transport in the Cape Blanc area of epipelagic fish larvae, the major group within the ichthyoplankton.

81-002177 Harned, C. N. and P. A. Hackney. OCCURRENCE OF LAKE STURGEON, *ACIPENSER FULVESCENS*, IN THE CUMBERLAND RIVER OF TENNESSEE. *J. Tenn. Acad. Sci.* 56(2):59-60. Apr. 1981. SFA 26(3)
[TVA, Norris, TN 37828]

81-002178 Holm, E. and G. A. Coker. FIRST CANADIAN RECORDS OF THE GHOST SHINER (*NOTROPIS BUCHANANI*) AND THE ORANGESPOTTED SUNFISH (*LEPOMIS HUMILIS*). *Can. Field-Nat.* 95(2):210-211. Apr.-June 1981. SFA 26(3)
[Dep. Ichthyol. Herpetol., Royal Ontario Mus., Toronto, ON M5S 2C6, Canada]

81-002179 Holm, T. and S. Mattson. *THOROGOBIUS EPHIPPIATUS* (PISCES) FOUND ON THE WEST COAST OF SWEDEN. *Sarsia* 66(1):87-88. 1981. SFA 26(3)
[Nobelgatan 11 A, S-416 57 Gothenburg, Sweden]

81-002180 Hughes, S. E. INITIAL U.S. EXPLORATION OF NINE GULF OF ALASKA SEAMOUNTS AND THEIR ASSOCIATED FISH AND SHELLFISH RESOURCES. *Mar. Fish. Rev.* 43(1):26-33. Jan. 1981. SFA 26(3)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

81-002181 Krumholz, L. A. OBSERVATIONS ON CHANGES IN THE FISH POPULATION OF THE OHIO RIVER FROM RAFINESQUE TO 1980. *Trans. Ky. Acad. Sci.* 42(1-2):1-15. Mar. 1981. SFA 26(3)
Fish samples from upper, middle and lower sections of the Ohio River revealed 50 species in the upper section during 1957-1959 and 1969-1979. The black bullhead predominated during the first sampling period but in 1969-1979 no bullheads were present, having been replaced by the emerald shiner as the dominant fish. In the middle section, 48 fish species were collected in 1957-1959 and 1969-1979. During the first sampling period the emerald shiner consituted about 50% of the population and the gizzard shad 30%, whereas in 1969-1979 the drum dominated (40%) followed by the emerald shiner (24%). In the lower section, the gizzard shad constituted one-third of the total numbers collected followed by the threadfin shad (22%) and the freshwater drum (18%). Comparison of the species composition from the three sections disclosed that the fish fauna of the Upper Ohio River is quite different from that of the middle section, which in turn differs greatly from the lower section. Only 25 species are common to all three sections. These differences reflect differences in gradient, the effects of impoundment, and in stream size. The effects of the introduction of exotic fish species are discussed, as is the history of ichthyologic research in the Ohio River.

81-002182 Loeng, H. NORDLIG UTBREDELSE AV LODDE OG TEMPERATURFORHOLDENE I BARENTSHAVET OM HØSTEN. [ON THE NORTHERLY DISTRIBUITON OF CAPELIN AND TEMPERATURE CONDITIONS IN THE BARENTS SEA IN AUTUMN.] *Fisken Havet* 1981(1):1-10. 1981. In Norwegian with English summ. SFA 26(3)
[Inst. Mar. Res., Bergen, Norway]

81-002183 McAllister, D. E. and D. St-Onge. POSTGLACIAL FOSSIL FISHES FROM COPPERMINE RIVER, NORTHWEST TERRITORIES, CANADA. *Can. Field-Nat.* 95(2):203-205. Apr.-June 1981. In English with French summ. SFA 26(3)
[Ichthyol. Sect., Natl. Mus. Nat. Sci., Ottawa, ON K1A 0M8, Canada]

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

81-002184 Mizera, J. J.; C. L. Cooper and C. E. Herdendorf. LIMNETIC LARVAL FISH IN THE NEARSHORE ZONE OF THE WESTERN BASIN OF LAKE ERIE. *J. Great Lakes Res.* 7(1):62-64. 1981. SFA 26(3)
[Cent. Lake Erie Res., Ohio State Univ., Columbus 43210]

81-002185 Modde, T. and S. T. Ross. SEASONALITY OF FISH OCCUPYING A SURF ZONE HABITAT IN THE NORTHERN GULF OF MEXICO. *NOAA Fish. Bull.* 78(4):911-922. Oct. 1980. SFA 26(3)
[Dep. Wildl. Fish. Sci., S. Dak. State Univ., Brookings 57007]

81-002186 Papaconstantinou, C. and E. Tortonese. ON A COLLECTION OF FISHES FROM THERMAIKOS GULF (NE. GREECE). *Thalassographica* 3(2):15-42. Dec. 1980. SFA 26(3)
[Inst. Oceanogr. Fish. Res., Athens, Greece]

81-002187 Paulin, C. D. and G. Habib. FIRST RECORD OF *LEPIDOCYBIUM FLAVOBRUNNEUM* (PISCES: GEMPYLIDAE) FROM NEW ZEALAND. *N.Z. J. Mar. Freshwater Res.* 14(4):405-407. 1980. SFA 26(3)
[Natl. Mus. N.Z., Private Bag, Wellington, New Zealand]

81-002188 Paulin, C. D. FISHES OF THE FAMILY BRAMIDAE RECORDED FROM NEW ZEALAND. *N.Z. J. Zool.* 8(1):25-31. 1981. SFA 26(3)
[Nat. Mus. N.Z., Private Bag, Wellington, New Zealand]

81-002189 Pethon, P. NEW RECORDS OF LUMINOUS FISHES IN NORTH NORWEGIAN WATERS. *Sarsia* 66(1):83-86. 1981. SFA 26(3)
[Zool. Mus., Sars gt. 1, Oslo 5, Norway]

81-002190 Piotrovskiy, A. S. and V. G. Prut'ko. THE OCCURRENCE OF THE GOBLIN SHARK, *SCAPANORHYNCHUS OWSTONI* (CHONDRICHTHYES, SCAPANORHYNCHIDAE), IN THE INDIAN OCEAN. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):124-125. 1980. SFA 26(3)
[AzcherNIRO, Kerch, USSR]

81-002191 Plosila, D. S. and G. W. LaBar. OCCURRENCE OF JUVENILE BLUEBACK HERRING IN LAKE CHAMPLAIN. *N.Y. Fish Game J.* 28(1):118. Jan. 1981. SFA 26(3)
[N.Y. State Dep. Environ. Conserv., Ray Brook 12977]

81-002192 Randall, J. E. NEW RECORDS OF FISHES FROM THE HAWAIIAN ISLANDS. *Pac. Sci.* 34(3):211-232. July 1980. SFA 26(3)
[Bernice P. Bishop Mus., P.O. Box 19000-A, Honolulu, HI 96819]

81-002193 Roberts, P. E. SURFACE DISTRIBUTION OF ALBACORE TUNA, *THUNNUS ALALUNGA* BONNATERRE, IN RELATION TO THE SUBTROPICAL CONVERGENCE ZONE EAST OF NEW ZEALAND. *N.Z. J. Mar. Freshwater Res.* 14(4):373-380. 1980. SFA 26(3)
[Fish. Res. Div., P.O. Box 19062, Wellington, New Zealand]

81-002194 Smith, D. G. and P. H. J. Castle. NEW HAWAIIAN RECORDS FOR TWO DYSOMMINE EELS (PISCES, SYNAPHOBRANCHIDAE). *Bull. Mar. Sci.* 31(2):460-461. Apr. 1981. SFA 26(3)
[Mar. Biomed. Inst., 200 University Blvd., Galveston, TX 77550]

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

81-002195 Tokranov, A. M. [DISTRIBUTION OF SCULPINS (PISCES, COTTIDAE) ON THE WEST KAMCHATKA SHELF IN SUMMER.] *Zool. Zh.* 60(2):229-237. Feb. 1981. In Russian with English summ. SFA 26(3)
[Pac. Res. Inst. Fish Oceanogr., Vladivostok, USSR]

81-002196 Tumokhin, I. G. DISCOVERY OF THE FRILL SHARK, *CHLAMYDOSELACHUS ANGUINEUS*, IN THE SOUTH-WEST INDIAN OCEAN. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):125-126. 1980. SFA 26(3)
[AzcherNIRO, Kerch, USSR]

81-002197 Zalewski, B. R. and J. B. Weir. REPORTS OF SIGNIFICANT RANGE EXTENSIONS. RANGE EXTENSIONS FOR 15 TELEOST FISHES IN THE HUDSON BAY LOWLANDS, ONTARIO. *Can. Field-Nat.* 95(2):212-214. Apr.-June 1981. SFA 26(3)
[Ontario Minist. Nat. Resour., Box 190, Moosonee, ON P0L 1Y0, Canada]

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY

81-002198 Švátora, M. and K. Pivnička. THE INFLUENCE OF TEMPERATURE AND ABUNDANCE ON GROWTH AND YEAR CLASS STRENGTH OF SOME SPECIES OF FISHES. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 137-142. 1981. SFA 26(3)
[Dep. Syst. Zool., Charles Univ., Praha, Czechoslovakia]

81-002199 Bimber, D. L. and S. A. Nicholson. FLUCTUATIONS IN THE MUSKELLUNGE (*ESOX MASQUINONGY* MITCHELL) POPULATION OF CHAUTAUQUA LAKE, NEW YORK. *Environ. Biol. Fishes* 6(2):207-211. 20 May 1981. SFA 26(3)
[Inst. Sci. Technol., Univ. Mich., 2200 Bonisteel Blvd., Ann Arbor 48109] Population and exploitation estimates were made from angler recaptures of Chautauqua Lake muskellunge, *Esox masquinongy* Mitchill. Fish were tagged during Conservation Department studies in 1941-1946, 1961-1965 and 1976-1978. Population estimates of adult fish ranged from one to seven fish per hectare and angler exploitation rates of tagged fish fluctuated from 3.8% to 14.1%. Relative catch indicators suggest a major decline in the lake's muskellunge population during the last decade. Overexploitation, habitat alteration and interspecific competition with recently introduced fish species were cited as probable causes of the decline.

81-002200 Carlson, D. M. and P. S. Bonislawsky. THE PADDLEFISH (*POLYODON SPATHULA*) FISHERIES OF THE MIDWESTERN UNITED STATES. *Fisheries (Bull. Am. Fish. Soc.)* 6(2):17-22, 26. Mar.-Apr. 1981. SFA 26(3)
[N.Y. State Dep. Environ. Conserv., Reg. 4, Stanford 12167]

81-002201 Claypool, D. THE HABITAT OF PLAINS KILLIFISH (*FUNDULUS KANSAE*) IN THE LOWER YELLOWSTONE RIVER DRAINAGE, MONTANA. *Proc. Mont. Acad. Sci.* 40:25-30. 1981. SFA 26(3)
[Dep. Nat. Resour. Conserv., Miles City 59301] Physical and chemical parameters of selected tributaries to the lower Yellowstone River with and without plains killifish (*Fundulus kansae*) were studied during the summer of 1979. The substrate in streams with plains killfish was predominantly clay-silt, while it was most frequently sand in those without plains killifish. No important difference in other physico-chemical parameters between streams with and without plains killifish were found.

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

81-002202 Holčí, J. and V. Hruška. THE IMPACT OF HYDROLOGICAL REGIME UPON THE FISH COMMUNITIES OF A RIVER. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 39-40. 1981. SFA 26(3)
[Lab. Fish. Res. Hydrobiol., Bratslava, Czechoslovakia]

81-002203 Mills, C. A. EGG POPULATION DYNAMICS OF NATURALLY SPAWNING DACE, *LEUCISCUS LEUCISCUS* (L.). *Environ. Biol. Fishes* 6(2):151-158. 20 May 1981. SFA 26(3)
[Freshwater Biol. Assoc., River Lab., East Stoke, Wareham, Dorset BH20 6BB, England] Survival of dace eggs in a chalkstream was 8.6 to 21.8% from spawning to hatching. The proportion of dead eggs in samples rose from 4.9% at the end of spawning to 59% after 13 days. The combined number of dead eggs, live eggs and the empty shells of eggs after hatching also began a steady decline soon after the end of spawning. Egg drift was estimated to be 2.0% of the initial egg population. Laboratory studies and field population estimates indicated that macroinvertebrates were capable of eating large numbers of dead eggs but much smaller numbers of live ones. A large part of the fall in egg numbers was accounted for by egg decomposition. There was a close relationship between the percentage of surviving eggs and substrate composition with poor survival in areas of high silt and low gravel content.

81-002204 Scarnecchia, D. L. EFFECTS OF STREAMFLOW AND UPWELLING ON YIELD OF WILD COHO SALMON (*ONCORHYNCHUS KISUTCH*) IN OREGON. *Can. J. Fish. Aquatic Sci.* 38(4):471-475. Apr. 1981. In English with French summ. SFA 26(3)
[Colo. Coop. Fish. Res. Unit, Colo. State Univ., Fort Collins 80523]

81-002205 Schaefer, W. F.; R. A. Heckmann and W. A. Swenson. POSTSPAWNING MORTALITY OF RAINBOW SMELT IN WESTERN LAKE SUPERIOR. *J. Great Lakes Res.* 7(1):37-41. 1981. SFA 26(3)
[Dep. Biol., Univ. Wis. Cent., West Bend 53095] Extensive die-offs of rainbow smelt, *Osmerus mordax* (Mitchell), have occurred in the western end of Lake Superior during each of the past several springs. Sex, age composition, and incidence of fungus infection in smelt from the 1977 die-off were compared with the same characteristics of smelt of the extant spawning population to determine the extent and possible causes of mortality. The die-off in 1977 began about 3 weeks after the end of the spawning run and continued for approximately 2 weeks. The occurrence of dead rainbow smelt was greatest near the Superior-Duluth harbor and decreased as distance from the harbor increased. Age structure of smelt that died was similar to that of the spawning population. Some factor or factors related to spawning may have caused the mortality. The most probale cause of the die-off was temperature stress on spawning smelt in the spawning areas which increased the susceptibility of smelt to the fungus *Saprolegnia* sp. and may have promoted osmoregulatory imbalance. Male smelt were more vulnerable to the cause of the die-off than female smelt; young fish, especially females, were more resistant than older fish.

81-002206 Schiavone, A., Jr. DECLINE OF THE WALLEYE POPULATION IN BLACK LAKE. *N.Y. Fish Game J.* 28(1):68-72. Jan. 1981. SFA 26(3)
[N.Y. State Dep. Environ. Conserv., Watertown, NY 13601] Black Lake has historically supported a prime walleye fishery. The population and fishery reportedly began to decline in the late 1960's. In 1975, information on the age structure among males, the abundance of fingerlings and the relative

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

81-002206 CONTINUED abundance of adults was collected. No walleye fingerlings were taken in trawls, and adult walleyes comprised only 1 per cent of the total gillnet catch over the 6-month sampling period. Analysis of the age composition of spawning males indicated that there had been no recruitment since 1971 and that recruitment in 1970 and 1971 had been low. The introduction of the black crappie in the early 1960's may have been associated with the walleye decline.

81-002207 Shustov, Yu. A.; I. L. Shurov and Yu. A. Smirnov. CONDITIONS OF EXISTENCE, BEHAVIOR AND DISTRIBUTION OF YOUNG *SALMO SALAR* IN A RIVER. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):119-123. 1980. SFA 26(3)
[Biol. Inst., Karelian Br. USSR Acad. Sci., Petrozavodsk, USSR]

IDENTIFICATION, KEYS, CLASSIFICATION

81-002208 Böhlke, J. E. and J. E. Randall. FOUR NEW GARDEN EELS (CONGRIDAE, HETEROCONGRINAE) FROM THE PACIFIC AND INDIAN OCEAN. *Bull. Mar. Sci.* 31(2):366-382. Apr. 1981. SFA 26(3)
[Acad. Nat. Sci., 19th and Parkway, Philadelphia, PA 19103]

81-002209 Balon, E. K. ABOUT PROCESSES WHICH CAUSE THE EVOLUTION OF GUILDS AND SPECIES. *Environ. Biol. Fishes* 6(2):129-138. 20 May 1981. SFA 26(3)
[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

81-002210 Birdsong, R. S. A REIVEW OF THE GOBIID FISH GENUS *MICROGOBIUS* POEY. *Bull. Mar. Sci.* 31(2):267-306. Apr. 1981. SFA 26(3)
[Dep. Biol. Sci., Old Dominion Univ., Norfolk, VA 23508]

81-002211 Buynak, G. L. and H. W. Mohr, Jr. KEY TO THE IDENTIFICATION OF SUCKER LARVAE IN THE SUSQUEHANNA RIVER NEAR BERWICK, PENNSYLVANIA. *Proc. Pa. Acad. Sci.* 54(2):161-164. 1980. SFA 26(3)
[Ichthyological Assoc., Inc., R.D. 1, Berwick, PA 18603] A key separating larval quillback (*Carpiodes cyprinus*), white sucker (*Catostomus commersoni*), northern hog sucker (*Hypentelium nigricans*), and shorthead redhorse (*Moxostoma macrolepidotum*) from the Susquehanna River is presented. Included are tables of various morphometric and meristic characteristics examined for each species and several illustrations showing distinguishing characteristics.

81-002212 Carlson, B. A. A NEW INDO-PACIFIC FISH OF THE GENUS *CIRRIPECTES* (BLENNIIDAE, SALARIINI). *Pac. Sci.* 34(4):407-414. Oct. 1980. SFA 26(3)
[Waikiki Aquarium, 2777 Kalakaua Ave., Honolulu, HI 96815]

81-002213 Collette, B. B. and J. L. Russo. A REVISION OF THE SCALY TOADFISHES, GENUS *BATRACHOIDES*, WITH DESCRIPTIONS OF TWO NEW SPECIES FROM THE EASTERN PACIFIC. *Bull. Mar. Sci.* 31(2):197-233. Apr. 1981. SFA 26(3)
[NMFS, Natl. Mus. Nat. Hist., Washington, DC 20560]

IDENTIFICATION, KEYS, CLASSIFICATION (CONTINUED)

81-002214 Edlund, A. M.; G. Sundmark and S. Thorman. THE IDENTIFICATION OF *POMATOSCHISTUS PICTUS, P. MICROPS,* AND *P. MINUTUS* (GOBIIDAE, PISCES). *Sarsia* 65(3-4):239-242. 1980. SFA 26(3)
[Dep. Zool., Uppsala Univ., Box 561, S-751 22 Uppsala, Sweden]

81-002215 Ferguson, M. M.; D. L. G. Noakes and R. G. Danzmann. MORPHOLOGICAL AND BIOCHEMICAL SYSTEMATICS OF CHUBS, *NOCOMIS BIGUTTATUS* AND *N. MICROPOGON* (PISCES: CYPRINIDAE), IN SOUTHERN ONTARIO. *Can. J. Zool.* 59(5):771-775. May 1981. In English with French summ. SFA 26(3)
[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

81-002216 Fernholm, B. and C. L. Hubbs. WESTERN ATLANTIC HAGFISHES OF THE GENUS *EPTATRETUS* (MYXINIDAE) WITH DESCRIPTION OF TWO NEW SPECIES. *NOAA Fish. Bull.* 79(1):69-83. Jan. 1981. SFA 26(3)
[Roskilde Univ., Dep. Biol. Chem., Box 260, DK-4000 Roskilde, Denmark]

81-002217 Fricke, R. *DIPLOGRAMMUS (CLIMACOGRAMMUS) PYGMAEUS* SP. NOV., A NEW CALLIONYMID FISH (PISCES, PERCIFORMES, CALLIONYMOIDEI) FROM THE SOUTH ARABIAN COAST, NORTHWESTERN INDIAN OCEAN. *J. Nat. Hist.* 15(4):685-692. July-Aug. 1981. SFA 26(3)
[Sallestr. 3a, D-3300 Braunschweig, West Germany]

81-002218 Hardy, G. S. A REDESCRIPTION OF THE PUFFERFISH *CONTUSUS RICHEI* (TETRAODONTIFORMES: TETRAODONTIDAE), AND DESCRIPTION OF A SECOND SPECIES OF *CONTUSUS. N.Z. J. Zool.* 8(1):11-23. 1981. SFA 26(3)
[Natl. Mus. N.Z., Private Bag, Wellington, New Zealand]

81-002219 Hoogerhoud, R. J. C. and F. Witte. REVISION OF SPECIES FROM THE *"HAPLOCHROMIS"* EMPODISMA GROUP. REVISION OF THE HAPLOCHROMINE SPECIES (TELEOSTEI, CICHLIDAE) FROM LAKE VICTORIA. PART II. *Neth. J. Zool.* 31(1):232-274. Mar. 1981. SFA 26(3)
[c/o Dr. C.D.N. Barel, Zool. Lab., Kaiserstr. 63, Postbus 9516, 2300 RA The Netherlands]

81-002220 Jensen, R. J. and C. D. Barbour. A PHYLOGENETIC RECONSTRUCTION OF THE MEXICAN CYPRINID FISH GENUS *ALGANSEA.* Syst. Zool. 30(1):41-57. Mar. 1981. SFA 26(3)
[Dep. Biol., St. Mary's Coll., Notre Dame, IN 46556]

81-002221 MacLellan, P.; G. E. (Buck) Newsome and P. A. Dill. DISCRIMINATION BY EXTERNAL FEATURES BETWEEN ALEWIFE (*ALOSA PSEUDOHARENGUS*) AND BLUEBACK HERRING (*A. AESTIVALIS*). *Can. J. Fish. Aquatic Sci.* 38(5):544-546. May 1981. In English with French summ. SFA 26(3)
[Dep. Bot., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada]

81-002222 McGuire, D. L. ANNOTATED KEY TO THE LARVAL SUCKERS (CATOSTOMIDAE) OF THE MISSOURI RIVER DRAINAGE, MONTANA. *Proc. Mont. Acad. Sci.* 40:1-8. 1981. SFA 26(3)
[Biol. Dep., Mont. State Univ., Bozeman 59717]

81-002223 Randall, J. E. TWO NEW INDO-PACIFIC LABRID FISHES OF THE GENUS *HALICHOERES,* WITH NOTES ON OTHER SPECIES OF THE GENUS. *Pac. Sci.* 34(4):415-432. Oct. 1980. SFA 26(3)
[Bernice P. Bishop Mus., P.O. Box 19000-A, Honolulu, HI 96819]

IDENTIFICATION, KEYS, CLASSIFICATION (CONTINUED)

81-002224 Russell, B. C. and J. E. Randall. THE LABRID FISH GENUS *PSEUDOLABRUS* FROM ISLANDS OF THE SOUTHEASTERN PACIFIC, WITH DESCRIPTION OF A NEW SPECIES FROM RAPA. *Pac. Sci.* 34(4):433-440. Oct. 1980. SFA 26(3)
[Aust. Mus., 6-8 College St., Sydney, New South Wales 2000, Australia]

81-002225 Salojärvi, K. and H. Auvinen. A COMPUTER PROGRAM FOR CLASSIFYING SYMPATRIC WHITEFISH (*COREGONUS LARVARETUS* L. *S.L.*) STOCKS. *Finn. Fish. Res.* 3:23-28. 1981. SFA 26(3)
[Cent. Fish Cult. Stn. North Finland, 658 Ohtaoja, SF-91999 Oulu, Finland]

81-002226 Savvaitova, K. A.; V. A. Maksimov, and V. D. Nesterov. THE SYSTEMATICS AND ECOLOGY OF CHARS OF THE GENUS *SALVELINUS* (SALMONIDAE) OF THE TAYMYR PENINSULA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(2):1-15. 1980. SFA 26(3)
[Dep. Ichthyol., Moscow Univ., USSR]

81-002227 Seegers, L. and J. H. Huber. *RIVULUS CRYPTOCALLUS* N. SP. VON DER INSEL MARTINIQUE. [*RIVULUS CRYPTOCALLUS* N. SP. FROM MARTINIQUE ISLAND.] *Senckenb. Biol.* 61(3-4):169-177. 30 Apr. 1981. In German with English summ. SFA 26(3)
[Zool. Inst., Univ. Köln, 1. Lehrstuhl, Weyertal 119, D-5000 Köln 41, West Germany]

81-002228 Small, G. J. A REVIEW OF THE BATHYAL FISH GENUS *ANTIMORA* (MORIDAE: GADIFORMES). *Proc. Calif. Acad. Sci.* 42(13):341-348. 24 June 1981. SFA 26(3)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

81-002229 Smith, P. J.; P. G. Benson and A. A. Frentzos. ELECTROPHORETIC IDENTIFICATION OF LARVAL AND O-GROUP FLOUNDERS (*RHOMBOSOLEA* SPP.) FROM WELLINGTON HARBOUR. *N.Z. J. Mar. Freshwater Res.* 14(4):401-404. 1980. SFA 26(3)
[Fish. Res. Div., P.O. Box 19062, Wellington, New Zealand]

81-002230 Soin, S. G. TYPES OF DEVELOPMENT OF SALMONIFORM FISHES AND THEIR TAXONOMIC IMPORTANCE. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.* 20(1):49-56. 1980. SFA 26(3)
[Dep. Ichthyol., Moscow Univ., USSR]

81-002231 Trunov, I. A. A NEW GENUS AND SPECIES OF GRENADIER, *HAPLOMACROURUS NUDIROSTRIS* (OSTEICHTHYES, MACROURIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):1-8. 1980. SFA 26(3)
[AtlanticNIRO, Kaliningrad, USSR]

81-002232 van Oijen, M. J. P.; F. Witte and E. L. M. Witte-Maas. AN INTRODUCTION TO ECOLOGICAL AND TAXONOMIC INVESTIGATIONS ON THE HAPLOCHROMINE CICHLIDS FROM THE MWANZA GULF OF LAKE VICTORIA. *Neth. J. Zool.* 31(1):149-174. Mar. 1981. SFA 26(3)
[Rijksmus. Nat. Hist., Raamsteeg 2, Postbus 9517, 2300 RA Leiden, The Netherlands]

IDENTIFICATION, KEYS, CLASSIFICATION (CONTINUED)

81-002233 Winterbottom, R. and A. R. Emery. A NEW GENUS AND TWO NEW SPECIES OF GOBIID FISHES (PERCIFORMES) FROM THE CHAGOS ARCHIPELAGO, CENTRAL INDIAN OCEAN. *Environ. Biol. Fishes* 6(2):139-149. 20 May 1981. SFA 26(3)
[Dep. Ichthyol. Herpetol., Royal Canadian Mus., 100 Queen's Park, Toronto, ON M5S 2C6, Canada]

81-002234 Witte, F. and E. L. M. Witte-Maas. HAPLOCHROMINE CLEANER FISHES: A TAXONOMIC AND ECO-MORPHOLOGICAL DESCRIPTION OF TWO NEW SPECIES. REVISION OF THE HAPLOCHROMINE SPECIES (TELEOSTEI, CICHLIDAE) FROM LAKE VICTORIA. PART I. *Neth. J. Zool.* 31(1):203-231. Mar. 1981. SFA 26(3).
[c/o Dr. C. D. N. Barel, Zool. Lab., Kaiserstr. 63, Postbus 9516, 2300 RA Leiden, The Netherlands]

PARASITES AND DISEASES-GENERAL

81-002235 Keith, R. E. LOSS OF THERAPEUTIC COPPER IN CLOSED MARINE SYSTEMS. *Aquaculture* 24(3-4):355-362. June 1981. SFA 26(3)
[Dep. Chem., Ohio State Univ., Mansfield 44906] The disappearance of therapeutic copper from solution in closed marine culture systems was investigated using a spectrophotometric assay. When copper sulfate or a copper sulfate-citric acid mixture was added to marine aquariums containing various calcareous filtrants, activated carbon, silica gravel, or cured coral, a relatively rapid decrease in copper concentration was observed. No such loss occurred when the copper compounds were mixed with artificial seawater alone. The rate of copper loss was proportional to the mass of filtrant present. When chelated or complexed forms of copper were used, no change in the copper concentration occurred in the presence of coral or activated carbon, and only a slow decrease took place in aquariums with other filtrants. Precipitation was not a significant mechanism of copper loss in the systems studied, and adsorption was most likely responsible, although ion-exchange or surface complex formation could not be excluded.

81-002236 Leong, T. S. and J. C. Holmes. COMMUNITIES OF METAZOAN PARASITES IN OPEN WATER FISHES OF COLD LAKE, ALBERTA. *J. Fish Biol.* 18(6):693-713. June 1981. SFA 26(3)
[J.C. Holmes: Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

81-002237 McReynolds, M. and J. D. Webster. PARASITES OF THE YELLOW BASS FROM TWO SOUTHERN INDIANA LAKES. *Proc. Indiana Acad. Sci.* 89:154-158. 1980. SFA 26(3)
[Dep. Biol., Hanover Coll., Hanover, IN 47423]

81-002238 Puffer, H. W. and M. L. Beal. CONTROL OF PARASITIC INFESTATIONS IN KILLIFISH (*FUNDULUS PARVIPINNIS*). *Lab. Anim. Sci.* 31(2):200-201. Apr. 1981. SFA 26(3)
[Dep. Pathol., Sch. Med., Univ. South. Calif., Los Angeles 90033] California killifish (*Fundulus parvipinnis*) trapped in a Southern California estuary were infested with *Gyrodactylus* sp, *Argulus* sp, or *Ergasilus sieboldii*. They were treated with 0,0-dimethyl 2,2,2-trichloro-1-hydroxyethylphosphonate (DTHP). The effective dosage regimen for *Gyrodactylus* was 7.50 mg/l for 1 hour on day 1, 3.25 mg/l for 1 hour on day 5, and 0.75 mg/l for 1 hour on day 9; for *Argulus*, 2.50 mg/l for 1 hour once only; for *Ergasilus*, 2.50 mg/l for 1 hour once every third day for three treatments. Toxicity testing indicated that repetitive

PARASITES AND DISEASES-GENERAL (CONTINUED)

81-002238 CONTINUED doses of 4.20 mg/1 were toxic and that static exposure of more than 1 hour to doses of 7.50 mg/1 were lethal to *Fundulus*.

81-002239 Threlfall, W. METAZOAN PARASITES OF TWO POPULATIONS OF RAINBOW SMELT IN NEWFOUNDLAND, CANADA. *J. Parasitol.* 67(1):129-131. Feb. 1981. SFA 26(3)
[Dep. Biol., Memorial Univ. Newfoundland, St. John's, NF A1B 3X9, Canada]

BACTERIAL DISEASES

81-002240 Aoki, T.; T. Kitao and K. Kawano. CHANGES IN DRUG RESISTANCE OF *VIBRIO ANGUILLARUM* IN CULTURED AYU, *PLECOGLOSSUS ALTIVELIS* TEMMINCK AND SCHLEGEL, IN JAPAN. *J. Fish Dis.* 4(3):223-230. May 1981. SFA 26(3)
[Dep. Fish., Fac. Agric., Miyazaki Univ., Miyazaki 880, Japan]

81-002241 Bullock, G. L. STREPTOCOCCAL INFECTIONS OF FISHES. *U.S. Fish Wildl. Serv. Fish Dis. Leafl.* 63. 7p. 1981. SFA 26(3)
[Natl. Fish Health Res. Lab., Kearneysville, WV 25430]

81-002242 Colorni, A.; I. Paperna and H. Gordin. BACTERIAL INFECTIONS IN GILT-HEAD SEA BREAM *SPARUS AURATA* CULTURED AT ELAT. *Aquaculture* 23(1-4):257-267. Apr. 1981. SFA 26(3)
[Maricult. Lab., Isr. Oceanogr. Limnol. Res., P.O. Box 1212, Elat, Israel]

81-002243 Egidius, E.; K. Andersen; E. Clausen and J. Raa. COLD-WATER VIBRIOSIS OR 'HITRA DISEASE' IN NORWEGIAN SALMONID FARMING. *J. Fish Dis.* 4(4):353-354. July 1981. SFA 26(3)
[Inst. Mar. Res., P.B. 2906, 5011 Bergen-Nordnes, Norway]

81-002244 Fukuda, Y. and R. Kusuda. [EFFICACY OF VACCINATION FOR PSEUDOTUBERCULOSIS IN CULTURED YELLOWTAIL BY VARIOUS ROUTES OF ADMINISTRATION.] *Bull. Jpn. Soc. Sci. Fish* 47(2):147-150. Feb. 1981. In Japanese with English summ. SFA 26(3)
[Fish. Dis. Lab., Fac. Agric., Kochi Univ., Nankoku, Kochi 783, Japan]

81-002245 Hayasaka, S. S. and J. Sullivan. FURUNCULOSIS IN CULTURED AMERICAN EEL *ANGUILLA ROSTRATA* (LE SUEUR). *J. Fish Biol.* 18(6):655-659. June 1981. SFA 26(3)
[Dep. Microbiol., Clemson Univ., Clemson, SC 29631] Diseased American eels, *Anguilla rostrata*, were collected from an eel culture facility in South Carolina and examined. The disease was characterized by skin lesions located on the body. A bacterium identified as *Aeromonas salmonicida* was isolated from the lesions and shown to be the causative agent. The bacterium was also isolated from the kidney during later stages of the disease.

81-002246 Jensen, J. O. T.; W. E. McLean and D. F. Alderdice. EFFECTS OF ACCESSORY FACTORS ON SURVIVAL OF NEWLY FERTILIZED SALMONID EGGS TREATED WITH AN ANTIBIOTIC. *Aquaculture* 23(1-4):295-307. Apr. 1981. SFA 26(3)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] A trial use of erythromycin phosphate was conducted in a salmonid hatchery to determine its efficacy, when used as a rinse of newly fertilized coho

BACTERIAL DISEASES (CONTINUED)

81-002246 CONTINUED (*Oncorhynchus kisutch*) eggs, as a prophylatic measure against vertical transmission of bacterial kidney disease (BKD). Substantial egg mortality occurring in this trial resulted in further investigation of the rinse technique used. An aqueous solution of 2 mg/l of erythromycin phosphate was found to have no deleterious effect on fertilization or activation of eggs. Egg viability was not affected by (a) delay between taking of gametes and egg fertilization (10 or 40 min.), (b) contact time between gametes at fertilization (1 or 10 min.), and (c) the number of rinses employed (1 or 2). Mortality of the type seen in the initial trial was concluded to have occurred through shock sensitivity of the eggs, arising from (d) delay between egg activation and transfer of treated eggs to incubation trays, and (e) the height from which treated eggs were poured into incubation trays. Recommendations are given for the use of prophylactic egg rinses at fertilization, while avoiding egg damage resulting from shock sensitivity. Although not conclusive, results of the initial trial indicated that the survivors essentially were free of BKD up to the time of release 18 months after their treatment, as eggs, with erythromycin phosphate.

81-002247 Lewis, D. H. IMMUNOENZYME MICROSCOPY FOR DIFFERENTIATING AMONG SYSTEMIC BACTERIAL PATHOGENS OF FISH. *Can. J. Fish. Aquatic Sci.* 38(4):463-466. Apr. 1981. In English with French summ. SFA 26(3)
[Dep. Vet. Microbiol. Parasitol., Coll. Vet. Med., Tex. A&M Univ., College Station 77843]

81-002248 Mitchum, D. L. and L. E. Sherman. TRANSMISSION OF BACTERIAL KIDNEY DISEASE FROM WILD TO STOCKED HATCHERY TROUT. *Can. J. Fish. Aquatic Sci.* 38(5):547-551. May 1981. In English with French summ. SFA 26(3)
[Res. Lab., Wyo. Game Fish Dep., University Station, Laramie 82071]

81-002249 Rodgers, L. J. and J. B. Burke. SEASONAL VARIATION IN THE PREVALENCE OF 'RED SPOT' DISEASE IN ESTUARINE FISH WITH PARTICULAR REFERENCE TO THE SEA MULLET, *MUGIL CEPHALUS* L. *J. Fish Dis.* 4(4):297-307. July 1981. SFA 26(3)
[Queensland Fish. Serv., South. Fish. Res. Cent., P.O. Box 5, Deception Bay, Queensland, Australia 4508]

81-002250 Snieszko, S. F. BACTERIAL GILL DISEASE OF FRESHWATER FISHES. *U.S. Fish Wildl. Serv. Fish Dis. Leafl.* 62. 11p. 1981. SFA 26(3)
[U.S. FWS, Natl. Fish Health Res. Lab., Kearneysville, WV 25430]

81-002251 Tajima, K.; M. Yoshimizu; Y. Ezura and T. Kimura. [STUDIES ON THE CAUSATIVE ORGANISMS OF VIBRIOSIS AMONG THE PEN-CULTURED COHO SALMON, *ONCORHYNCHUS KISUTCH* IN JAPAN.] *Bull. Jpn. Soc. Sci. Fish.* 47(1):35-42. Jan. 1981. In Japanese with English summ. SFA 26(3)
[Lab. Microbiol., Fac. Fish., Hokkaido Univ., Hakodate, Hokkaido 041, Japan]

FUNGAL DISEASES

81-002252 Cadwallader, P. L. and G. J. Gooley. AN EVALUATION OF THE USE OF THE AMPHIPOD *AUSTROCHILTONIA* TO CONTROL GROWTH OF *SAPROLEGNIA* ON THE EGGS OF MURRAY COD *MACCULLOCHELLA PEELI* (MITCHELL). *Aquaculture*

FUNGAL DISEASES (CONTINUED)

81-002252 CONTINUED 24(1-2):187-190. May 1981. SFA 26(3)
[Fish. Wildl. Div., Minist. Conserv., Snobs Ck. Freshwater Res. Stn. Hatchery, P.B. 20, Alexandra, Victoria 3714, Australia] An experiment was undertaken to evaluate the use of the amphipod *Austrochiltonia* in controlling the growth of the fungus *Saprolegnia* on the eggs of Murray cod. The mean percentage survival of eggs and fry after 9 days was only 44.8% for *Austrochiltonia*-treated eggs. This value was not significantly different ($P > 0.05$) from that for groups of eggs in which no attempt was made to control fungal growth (57.3% survival), but was significantly less ($P < 0.05$) than that for groups of eggs from which dead and fungus-covered eggs were hand-picked daily (76% survival).

81-002253 Hager, R. C.; R. C. Kolb and D. R. Bartlett. DEVICE FOR AUTOMATICALLY TREATING FIN-CLIPPED FISH WITH FUNGICIDE SOLUTIONS. *Prog. Fish-Cult.* 43(2):84-85. Apr. 1981. SFA 26(3)
[Wash. Dep. Fish., Olympia 98504]

PROTOZOAN DISEASES

81-002254 Beeler, C. R. FISH PARASITES: THE CRYOPRESERVATION OF *ICHTHYOPHTHIRIUS MULTIFILIIS*. *Fish Health News* 9(3):i. July 1980. SFA 26(3)
[Kans. State Univ., Div. Biol., Manhattan 66506]

81-002255 Copland, J. W. THE OCCURRENCE AND DISTRIBUTION OF *MYXIDIUM GIARDI* CÉPÈDE, 1906 IN WILD AND CULTURED EUROPEAN EELS, *ANGUILLA ANGUILLA* L., IN ENGLAND. *J. Fish Dis.* 4(3):231-242. May 1981. SFA 26(3)
[Reg. Vet. Lab., P.O. Box 388, Benalla, Victoria 3672, Austrâlia]

81-002256 Crandall, T. A. and P. R. Bowser. A MICROSPORIDIAN INFECTION IN A NATURAL POPULATION OF MOSQUITOFISH, *GAMBUSIA AFFINIS* (BAIRD AND GIRARD). *J. Fish Dis.* 4(4):317-324. July 1981. SFA 26(3)
[P. R. Bowser: Coll. Vet. Med., Miss. State Univ., P.O. Drawer V, Mississippi State 39762]

81-002257 Grögl, M.; C. J. Marinkelle; M. F. Suarez; N. de Sanchez and F. Guhl. *TRYPANOSOMA MAGDALENAE* SP. N. (PROTOZOA: KINETOPLASTIDA) FROM A FRESHWATER TELEOST, *PETENIA KRAUSSII*, IN COLOMBIA. *J. Parasitol.* 66(6):1022-1026. Dec. 1980. SFA 26(3)
[Dep. Biol., Wake Forest Univ., Winston-Salem, NC 27109]

81-002258 Ghittino, P.; G. Mezzani and G. Arlati. MORTALITÀ DA MALATTIA BRANCHIALE CONNESSA CON DERMOCISTIDIOSI IN CIECHE D'ANGUILLA (*ANGUILLA ANGUILLA*) ALLEVATE INTENSIVAMENTE. [MORTALITY BY GILL DISEASE ASSOCIATED WITH DERMOCYSTIDIOSIS IN ELVERS (*ANGUILLA ANGUILLA*) INTENSELY RAISED.] *Riv. It. Piscic. Ittiop.* 16(1):32-35. Jan.-Mar. 1981. In Italian with English summ. SFA 26(3)
[Ist. Zooprof. Sper. Piemonte, Via Bologna, 148, 10154 Torino, Italy]

PROTOZOAN DISEASES (CONTINUED)

81-002259 Goven, B. A.; D. L. Dawn and J. B. Gratzek. PROTECTION OF CHANNEL CATFISH (*ICTALURUS PUNCTATUS*) AGAINST *ICHTHYOPHTHIRIUS MULTIFILIIS* (FOUQUET) BY IMMUNIZATION WITH VARYING DOSES OF *TETRAHYMENA PYRIFORMIS* (LWOFF) CILIA. *Aquaculture* 23(1-4):269-273. Apr. 1981. SFA 26(3)
[Dep. Med. Microbiol., Coll. Vet. Med., Univ. Ga., Athens 30602] Channel catfish, *Ictalurus punctatus*, were immunized with varying doses of *Tetrahymena pyriformis* ciliary antigen, and challenged with *Ichthyophthirius multifiliis*. Results indicated that two doses of either 5µg or 25µg of *T. pyriformis* ciliary antigen conferred a high degree of protection against challenge with *I. multifiliis*. Only 3.1% (5µg dose) and 2.8% (5µg dose) of the fish in these groups developed clinical disease resulting in death. Two doses of either 10 µg or 2.5µg of antigen produced a significant but not acceptable degree of protection, while 1.0µg of antigen produced no protection.

81-002260 Hawkins, W. E.; M. A. Solangi and R. M. Overstreet. ULTRASTRUCTURAL EFFECTS OF THE COCCIDIUM, *EIMERIA FUNDULI* DSZYNSKI, SOLANGI AND OVERSTREET, 1979 ON THE LIVER OF KILLIFISHES. *J. Fish Dis.* 4(4):281-295. July 1981. SFA 26(3)
[Gulf Coast Res. Lab., Ocean Springs, MS 39564]

81-002261 Joshi, D. B. and R. S. Tandon. EFFECTS OF TRYPANOSOME INFECTION ON SOME HAEMATOLOGIC VALUES IN TEN SPECIES OF FRESH WATER TELEOSTS. *J. Anim. Morphol. Physiol.* 27(1-2):39-44. June-Dec. 1980. SFA 26(3)
[P.G. Dep. Zool., Kumaun Univ. Coll., Almora (U.P.), India]

81-002262 Modin, J. C. *MICROSPORIDIUM RHABDOPHILIA* N. SP. FROM RODLET CELLS OF SALMONID FISHES. *J. Fish Dis.* 4(3):203-211. May 1981. SFA 26(3)
[Inland Fish. Br., Dep. Fish Game, Fish Dis. Lab., Rancho Cordova, CA 95670]

81-002263 Price, R. L. and J. W. Mellen. *MYXOBOLUS MICROCYSTUS* SP. N. (PROTOZOA: MYXOSPORIDA) FROM THE GILLS OF *MICROPTERUS SALMOIDES* (LACÉPÈDE 1802) IN SOUTHERN ILLINOIS. *J. Parasitol.* 66(6):1019-1021. Dec. 1980. SFA 26(3)
[Dep. Zool., South. Ill. Univ., Carbondale 62901]

81-002264 Takvorian, P. M. and A. Cali. THE OCCURRENCE OF *GLUGEA STEPHANI* (HAGENMULLER, 1899) IN AMERICAN WINTER FLOUNDER, *PSEUDOPLEURONECTES AMERICANUS* (WALBAUM) FROM THE NEW YORK-NEW JERSEY LOWER BAY COMPLEX. *J. Fish Biol.* 18(4):491-501. Apr. 1981. SFA 26(3)
[Dep. Zool. Physiol., Rutgers Univ., Newark, NJ 07102]

VIRAL DISEASES

81-002265 Copes, P. and J. L. Knetsch. RECREATIONAL FISHERIES ANALYSIS: MANAGEMENT MODES AND BENEFIT IMPLICATIONS. *Can. J. Fish. Aquatic Sci.* 38(5):559-570. May 1981. In English with French summ. SFA 26(3)
[Dep. Econ., Simon Fraser Univ., Burnaby, BC V5A 1S6, Canada]

VIRAL DISEASES (CONTINUED)

81-002266 Dorson, M. and C. Torchy. THE INFLUENCE OF FISH AGE AND WATER TEMPERATURE ON MORTALITIES OF RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON, CAUSED BY A EUROPEAN STRAIN OF INFECTIOUS PANCREATIC NECROSIS VIRUS. *J. Fish Dis.* 4(3):213-221. May 1981. SFA 26(3)
[Lab. d'Ichtyopathol., I.N.R.A., 78850 Thiverval-Grignon, France]

81-002267 Leong, J. C.; J. L. Fendrick; S. Youngman and A. Lee. EFFECT OF POLYBRENE ON THE INFECTIVITY OF INFECTIOUS HAEMOPOIETIC NECROSIS VIRUS IN TISSUE CULTURE. *J. Fish Dis.* 4(4):335-344. July 1981. SFA 26(3)
[Dep. Microbiol., Oreg. State Univ., Corvallis 97331]

81-002268 Malsberger, R. G. and G. Lautenslager. FISH VIRUSES: RHABDOVIRUS ISOLATED FROM A SPECIES OF THE FAMILY CICHLIDAE. *Fish Health News* 9(2):i-iii. Apr. 1980. SFA 26(3)
[Dep. Biol., Lehigh Univ., Bethlehem, PA 18015]

81-002269 Molnár and G. Borros. A LIGHT AND ELECTRON MICROSCOPIC STUDY OF THE AGENT OF CARP MUCOPHILOSIS. *J. Fish Dis.* 4(4):325-334. July 1981. SFA 26(3)
[Vet. Med. Res. Inst., Hungarian Acad. Sci., H-1581 Budapest, P.O. Box 18XIV, Hungary]

81-002270 Morrison, C.; J. Cornick; G. Shum and B. Zwicker. MICROBIOLOGY AND HISTOPATHOLOGY OF 'SADDLEBACK' DISEASE OF UNDERYEARLING ATLANTIC SALMON, *SALMO SALAR* L. *J. Fish Dis.* 4(3):243-258. May 1981. SFA 26(3)
[Dep. Fish Oceans, Halifax Lab., Halifax, NS B3J 2S7, Canada] Heavy mortalities of underyearling Atlantic salmon parr have occurred at the Mactaquac Fish Culture Station in New Brunswick as the result of 'saddleback' disease. The organism causing this lesion was isolated and identified as *Flexibacter columnaris*. This bacterium was transmitted to other salmon parr, where it produced the typical saddle lesion from which it was re-isolated. The condition was more readily transmitted at 20°C than at 15°C. Transmission required entrance to the dermis through a break in the epidermal surface and was unsuccessful in intact fish. The morphology of the saddleback isolate and its histopathological effect on the fish tissues is described. *F. columnnaris* appeared to be restricted to the dermis and underlying muscle of the saddle area when histological techniques were used, although it was also isolated from the kidneys of some affected fish. The gills, kidney and other organs of the fish did not seem to be affected by the presence of *F. columnaris*.

81-002271 Swanson, R. N. and J. H. Gillespie. AN INDIRECT FLUORESCENT ANTIBODY TEST FOR THE RAPID DETECTION OF INFECTIOUS PANCREATIC NECROSIS VIRUS IN TISSUES. *J. Fish Dis.* 4(4):309-315. July 1981. SFA 26(3)
[Osborn Lab. Mar. Sci., N.Y. Zool. Soc., Seaside Park, Coney Island, Brooklyn, NY 11224] An indirect fluorescent antibody (IFA) test was developed to detect viral antigen in tissue sections prepared from rainbow trout experimentally inoculated with infectious pancreatic necrosis virus (IPNV). Specific fluorescence was present in the pancreatic acinar tissue and occurred as brilliant fluorescence throughout the mesentery surrounding the pyloric caeca and intestines. In addition, multiple foci of fluorescent cells were seen occasionally in the kidneys and liver of infected fry. Fluorescence was not observed in tissues other than the pancreas, kidneys, and liver. The IFA test was found to be quite specific and offers a rapid means of diagnosing IPN during acute outbreaks.

OTHER DISEASES AND PARASITES

81-002272 Amin, O. M. *FESSISENTIS TICHIGANENSIS* SP. NOV. (ACANTHOCEPHALA: FESSISENTIDAE) FROM WISCONSIN FISHES, WITH A KEY TO SPECIES. *J. Parasitol.* 66(6):1039-1045. Dec. 1980. SFA 26(3)
[Sci. Div., Univ. Wis.-Parkside, Kenosha 53141]

81-002273 Ashley, D. C. OBSERVATIONS ON THE POPULATION BIOLOGY OF THREE ACANTHOCEPHALANS IN A GREAT PLAINS RESERVOIR. *Ph.D. dissertation, Univ. Nebr. (Lincoln)* 178p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(11):4030. May 1981. SFA 26(3)

81-002274 Bashirullah, A. K. M. and E. H. Williams. FIVE NEW SPECIES OF THE GENUS *SPIROCAMALLANUS* OLSEN, 1952 (CAMALLANIDAE, NEMATODA) FROM MARINE FISHES. *J. Helminthol.* 54(4):247-252. Dec. 1980. SFA 26(3)
[Inst. Oceanogr., Univ. Oriente, Apt.-94, Cumana, Venezuela]

81-002275 Benjamin, M. FACTORS ASSOCIATED WITH THE SEASONAL VARIATION IN THE INCIDENCE OF PITUITARY CYSTS IN NINE-SPINED STICKLEBACKS, *PUNGITIUS PUNGITIUS* L. *Acta Zool. (Stockh.)* 62(2):121-128. 1981. SFA 26(3)
[Dep. Anat., University College, Cathays Park, Cardiff CF1 1XL, Wales]

81-002276 Bullock, A. M. and R. J. Roberts. SUNBURN LESIONS IN SALMONID FRY: A CLINICAL AND HISTOLOGICAL REPORT. *J. Fish Dis.* 4(3):271-275. May 1981. SFA 26(3)
[Dunstaffnage Mar. Res. Lab., Oban, Argyll, Scotland]

81-002277 Bylund, G. and O. Sumari. LABORATORY TESTS WITH DRONCIT AGAINST DIPLOSTOMIASIS IN RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON. *J. Fish Dis.* 4(3):259-264. May 1981. SFA 26(3)
[Inst. Parasitol., Åbo Akad., SF-20500 Åbo 50, Finland]

81-002278 Chernyshov, V. I. and A. R. Isuyev. THE ETIOLOGY OF FREE RADICAL PATHOLOGY IN THE STURGEONS, *ACIPENSER GÜLDENSTÄDTI*, *ACIPENSER STELLATUS*, AND *HUSO HUSO* DURING THE PERIOD OF EMBRYOGENY. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(2):119-128. 1980. SFA 26(3)
[Biol. Fac., Moscow Univ., USSR] Free radical pathology originates in sturgeons during the period of embryonic development under optimum conditions when there is an insufficiency in the ovum of an antioxidant buffer. The trigger is the formation in the developing eggs of products of free radical peroxide oxidation of lipids in quantities not characteristic of physiologically normal processes, during which the substances prove to be autotoxins. During a comparative analysis of experimental and theoretical material it was established that autotoxins modify the active and passive permeability of the cytomembranes and envelopes of the eggs, disturb the energy and constructive metabolisms in embryogeny and may cause deformity and the death of the embryos. The possibility of prevention of free radical pathology by antioxidants is shown. It is suggested that for commercial fisheries practice a method of incubation consisting in treating the egg immediately after fertilization with multi-component mixtures of aqueous solutions of antioxidants and synergists with antioxidant action may prove very promising.

81-002279 Curtis, M. A. OBSERVATIONS ON THE OCCURRENCE OF *DIPLOSTOMUM SPATHACEUM* AND *SCHISTOCEPHALUS* SP. IN NINESPINE STICKLEBACKS (*PUNGITIUS PUNGITIUS*) FROM THE BELCHER ISLANDS, NORTHWEST TERRITORIES,

OTHER DISEASES AND PARASITES (CONTINUED)

81-002279 CONTINUED CANADA. *J. Wildl. Dis.* 17(2):241-246. Apr. 1981. SFA 26(3)
[Inst. Parasitol., McGill Univ., MacDonald Coll., Ste. Anne de Bellevue, PQ H9X 1C0, Canada]

81-002280 Deardorff, T. L. ADULT ASCARIDOID NEMATODES FROM FISHES OF THE NORTHERN GULF OF MEXICO WITH NOTES ON SOME LARVAL FORMS. *Ph.D. dissertation, Univ. South. Miss.* 221p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(11):3979. May 1981. SFA 26(3)

81-002281 Grizzle, J. M.; T. E. Schwedler and A. L. Scott. PAPILLOMAS OF BLACK BULLHEADS, *ICTALURUS MELAS* (RAFINESQUE), LIVING IN A CHLORINATED SEWAGE POND. *J. Fish Dis.* 4(4):345-351. July 1981. SFA 26(3)
[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36776]

81-002282 Gupta, N. K. and C. L. Duggal. ON *ZEYLANEMA JULLUNDURENSE*--A NEW NEMATODE PARASITE FROM A FRESHWATER FISH, *MASTACEMBELUS ARMATUS*, AT JULLUNDUR (PUNJAB) AND A KEY TO THE SPECIES OF ITS GENUS. *Res. Bull. Panjab Univ. Sci.* 28(3-4):175-178. Dec. 1977. SFA 26(3)
[Dep. Zool., Panjab Univ., Chandigarh, India]

81-002283 Gupta, N. K. and A. Kumari. ON *HAMACREADIUM MANTERI* N. SP. (TREMATODA: ALLOCREADIIDAE) FROM A FRESH-WATER FISH *CHELA BACALA* AND *CHELA GORA* AT ROPAR AND LUDHIANA. *Res. Bull. Panjab Univ. Sci.* 25(3-4):199-202. Dec. 1974. SFA 26(3)
[Dep. Zool., Panjab Univ., Chandigarh, India]

81-002284 Hine, P. M. and R. I. C. C. Francis. DISTRIBUTION OF HELMINTHS IN THE DIGESTIVE TRACTS OF NEW ZEALAND FRESHWATER EELS. 3. INTERSPECIFIC ASSOCIATIONS AND CONCLUSIONS. *N.Z. J. Mar. Freshwater Res.* 14(4):349-356. 1980. SFA 26(3)
[Fish. Res. Div., P.O. Box 19062, Wellington, New Zealand]

81-002285 Hine, P. M. DISTRIBUTION OF HELMINTHS IN THE DIGESTIVE TRACTS OF NEW ZEALAND FRESHWATER EELS. 2. DISTRIBUTION OF NEMATODES. *N.Z. J. Mar. Freshwater Res.* 14(4):339-347. 1980. SFA 26(3)
[Fish. Res. Div., P.O. Box 19062, Wellington, New Zealand]

81-002286 Hine, P. M. DISTRIBUTION OF HELMINTHS IN THE DIGESTIVE TRACTS OF NEW ZEALAND FRESHWATER EELS. 1. DISTRIBUTION OF DIGENEANS. *N.Z. J. Mar. Freshwater Res.* 14(4):329-338. 1980. SFA 26(3)
[Fish. Res. Div., P.O. Box 19062, Wellington, New Zealand]

81-002287 Johnston, B. R. and D. W. Halton. OCCURRENCE OF *BUCEPHALOIDES GRACILESCENS* METACERCARIAE IN THREE SPECIES OF GADOID FISH. *J. Fish Biol.* 18(6):685-691. June 1981. SFA 26(3)
[Dep. Zool., Queen's Univ., Belfast BT7 1NN, Northern Ireland]

81-002288 Kirby, J. M. SEASONAL OCCURRENCE OF THE ECTOPARASITE *GYRODACTYLUS ATRATULI* ON SPOTFIN SHINERS. *Trans. Am. Fish. Soc.* 110(3):462-464. May 1981. SFA 26(3)
[Biol. Dep., VPI&SU, Blacksburg, VA 24061]

OTHER DISEASES AND PARASITES (CONTINUED)

81-002289 Knuckles, J. L. *ARGULUS MACULOSUS* (WILSON) FROM THE PUMPKINSEED, *LEPOMIS GIBBOSUS* (LINNAEUS). *J. Parasitol.* 66(6):919. Dec. 1980. SFA 26(3)
[Area Biol., Fayetteville State Univ., Fayetteville, NC 28301]

81-002290 Kuperman, B. I. TAPEWORMS OF THE GENUS *TRIAENOPHORUS*, PARASITES OF FISHES. viii + 222p. 1981. Published for U.S. Dep. Interior and Natl. Sci. Found., Washington, DC, by Amerind Publ. Co. Pvt. Ltd., New Delhi. SFA 26(3)

81-002291 Murchelano, R. A. and R. L. Edwards. AN ERYTHROPHOROMA IN ORNAMENTAL CARP, *CYPRINUS CARPIO* L. *J. Fish Dis.* 4(3):265-268. May 1981. SFA 26(3)
[NMFS, Oxford Lab., Oxford, MD 21654]

81-002292 Narasimhulu, S. V. and R. Madhavi. A NEW ASPIDOGASTRID TREMATODE *LOBATOSTOMA HANUMANTHAI* N. SP. FROM A MARINE FISH IN THE BAY OF BENGAL. *J. Helminthol.* 54(4):233-239. Dec. 1980. SFA 26(3)
[Dep. Zool., Andhra Univ., Waltair 530003, India]

81-002293 Ogawa, K, and S. Egusa. REDESCRIPTION OF THE DEVELOPMENT OF *HETERAXINE HETEROCERCA* (MONOGENEA: HETERAXINIDAE) WITH A NOTE ON THE RELATIONSHIP BETWEEN THE ASYMMETRY AND THE SITE OF ATTACHMENT TO THE GILL. *Bull. Jpn. Soc. Sci. Fish.* 47(1):1-7. Jan. 1981. SFA 26(3)
[Dep. Fish., Fac. Agric., Univ. Tokyo, Tokyo 113, Japan]

81-002294 Skorping, A. SEASONAL DYNAMICS IN ABUNDANCE, DEVELOPMENT AND PATTERN OF INFECTION OF *BUNODERA LUCIOPERCAE* (MÜLLER) IN PERCH, *PERCA FLUVIATILIS* L. FROM AN OLIGOTROPHIC LAKE IN NORWAY. *J. Fish Biol.* 18(4):401-410. Apr. 1981. SFA 26(3)
[Inst. Biol. Geol., Univ. Tromsø, Box 790, 9001 Tromsø, Norway] Samples of perch, *Perca fluviatilis* L., were examined monthly for the presence of the intestinal trematode *Bunodera luciopercae* (Müller). Marked seasonal cycles in incidence and intensity of infection were found, with a minimum level in July, when all the fish examined were free of the fluke, and a maximum level in February. Five developmental stages of the fluke were recognized and the seasonal changes in the percentage distribution of these stages were studied. Infective larvae were found in the period August-March, with a peak in January. Gravid worms were mainly found in the period May-June. The frequency distribution of parasite counts were over-dispersed and followed the negative binomial distribution within fish samples from different periods of the year.

81-002295 Thune, R. L. and W. A. Rogers. GILL LESIONS IN BLUEGILL, *LEPOMIS MACROCHIRUS* RAFINESQUE, INFESTED WITH *CLEIDODISCUS ROBUSTUS* MUELLER, 1934 (MONOGENEA: DACTYLOGYRIDAE). *J. Fish Dis.* 4(3):277-280. May 1981. SFA 26(3)
[Dep. Vet. Microbiol. Parasitol., La. State Univ., Baton Rouge 70803]

81-002296 Williams, A. D. and R. A. Campbell. *ECHINOBOTHRIUM BONASUM* SP. N., A NEW CESTODE FROM THE COWNOSE RAY, *RHINOPTERA BONASUS* (MITCHELL 1815), IN THE WESTERN NORTH ATLANTIC. *J. Parasitol.* 66(6):1036-1038. Dec. 1980. SFA 26(3)
[Southeast. Mass. Univ., North Dartmouth 02747]

OTHER DISEASES AND PARASITES (CONTINUED)

81-002297 Wolf, K.; M. E. Markiw; J. M. Cruz; M. H. Galhano; J. Eiras and R. L. Herman. NON-MYXOSPORIDAN BLACKTAIL SALMONIDS. *J. Fish Dis.* 4(4):355-357. July 1981. SFA 26(3)
[Natl. Fish. Health Res. Lab., Rt. 3, Box 50, Kearneysville, WV 25430]

POLLUTION

81-002298 Brevik, E. M. ORGANOCHLORINE RESIDUES IN FISH FROM LAKE MJØSA IN NORWAY. *Bull. Environ. Contam. Toxicol.* 26(5):679-680. May 1981. SFA 26(3)
[Inst. Energy Technol., P.O.Box 40, N-2007, Kjeller, Norway]

81-002299 Cappon, C. J. and J. C. Smith. MERCURY AND SELENIUM CONTENT AND CHEMICAL FORM IN FISH MUSCLE. *Arch. Environ. Contam. Toxicol.* 10(3):305-319. 1981. SFA 26(3)
[Environ. Health Sci. Cent., Univ. Rochester Sch. Med. Dent., Rochester, NY 14642] Data on the content, chemical form, and distribution of mercury and selenium in edible muscle are presented for several species of marine and freshwater fish. For most species, 60 to 95% of the total mercury content is present as methylmercury. For all species, 15 to 35% of the total selenium content is in the form of selenate (Se VI). Muscle selenium content does not correlate with the corresponding mercury content. For freshwater and processed (canned) marine samples, 60 to 90% of the total mercury content is water-extractable. On a percentage basis, methylmercury is slightly more extractable than inorganic mercury. For nonprocessed marine samples, only 25 to 45% of the total mercury is water-extractable, inorganic mercury being more extractable than methylmercury. For all species, 55 to 80% of the total selenium content is water-extractable, Se VI is more extractable on a percentage basis than selenite (Se IV) and selenide (Se-II).

81-002300 Crouse, M. R.; C. A. Callahan; K. W. Malueg and S. W. Dominquez. EFFECTS OF FINE SEDIMENTS ON GROWTH OF JUVENILE COHO SALMON IN LABORATORY STREAMS. *Trans. Am. Fish. Soc.* 110(2):281-286. Mar. 1981. SFA 26(3)
[Bur. Reclam., P.O. Box 700, Vale, OR 97918]

81-002301 Davies, I. M. SURVEY OF TRACE ELEMENTS IN FISH AND SHELLFISH LANDED AT SCOTTISH PORTS 1975-76. *Scot. Fish. Res. Rep.* No. 19. 28p. 1981. SFA 26(3)
[Mar. Lab., Aberdeen, Scotland]

81-002302 Evans, M. S. DISTRIBUTION OF ZOOPLANKTON POPULATIONS WITHIN AND ADJACENT TO A THERMAL PLUME. *Can. J. Fish. Aquatic Sci.* 38(4):441-448. Apr. 1981. In English with French summ. SFA 26(3)
[Great Lakes Res. Div., Univ. Mich., Ann Arbor 48109]

81-002303 Gardner, M. B. EFFECTS OF TURBIDITY ON FEEDING RATES AND SELECTIVITY OF BLUEGILLS. *Trans. Am. Fish. Soc.* 110(3):446-450. May 1981. SFA 26(3)
[Dep. Zool. NJ-15, Univ. Wash., Seattle 98195]

81-002304 Hora, M. E. REDUCTION OF POLYCHLORINATED BIPHENYL (PCB) CONCENTRATIONS IN CARP (*CYPRINUS CARPIO*) FILLETS THROUGH SKIN REMOVAL. *Bull. Environ. Contam. Toxicol.* 26(3):364-366. Mar. 1981. SFA 26(3)
[Div. Water Qual., Minn. Pollut. Control Agency, Roseville 55113]

POLLUTION (CONTINUED)

81-002305 Ichikawa, R. and S. Ohno. URANIUM CONTENT IN MARINE FISH. *Bull. Jpn. Soc. Sci. Fish.* 47(2):289. Feb. 1981. SFA 26(3)
[Div. Environ. Health, Natl. Inst. Radiol. Sci., Chiba 260, Japan]

81-002306 Johnston, D. W. and D. J. Wildish. AVOIDANCE OF DREDGE SPOIL BY HERRING (*CLUPEA HARENGUS HARENGUS*). *Bull. Environ. Contam. Toxicol.* 26(3):307-314. Mar. 1981. SFA 26(3)
[Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

81-002307 Marks, P. J.; D. Plaskett; I. C. Potter and J. S. Bradley. RELATIONSHIP BETWEEN CONCENTRATION OF HEAVY METALS IN MUSCLE TISSUE AND BODY WEIGHT OF FISH FROM THE SWAN-AVON ESTUARY, WESTERN AUSTRALIA. *Aust. J. Mar. Freshwater Res.* 31(6):783-793. Dec. 1980. SFA 26(3)
[Sch. Environ. Life Sci., Murdoch Univ., Murdoch, Western Australia 6150]

81-002308 Nulton, C. P. and D. E. Johnson. AROMATIC HYDROCARBONS IN MARINE TISSUES FROM THE CENTRAL GULF OF MEXICO. *J. Environ. Sci. Health A Environ. Sci. Eng. (Marcel Dekker, Inc., N.Y.)* 16(3):271-288. 1981. SFA 26(3)
[Southwest Res. Inst., 6220 Culebra Rd., San Antonio, TX 78284]

81-002309 Prince, E. D. and L. J. Mengel. AGGREGATION OF SPOTTAIL SHINERS IN THE HEATED DISCHARGE OF A NUCLEAR POWER STATION. *Trans. Am. Fish. Soc.* 110(2):221-225. Mar. 1981. SFA 26(3)
[NMFS, 75 Virginia Beach Dr., Miami, FL 33149]

81-002310 Stout, V. F. and F. L. Beezhold. CHLORINATED HYDROCARBON LEVELS IN FISHES AND SHELLFISHES OF THE NORTHEASTERN PACIFIC OCEAN, INCLUDING THE HAWAIIAN ISLANDS. *Mar. Fish. Rev.* 43(1):1-12. Jan. 1981. SFA 26(3)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

81-002311 Thomann, R. V. EQUILIBRIUM MODEL OF FATE MICROCONTAMINANTS IN DIVERSE AQUATIC FOOD CHAINS. *Can. J. Fish. Aquatic Sci.* 38(3):280-296. Mar. 1981. In English with French summ. SFA 26(3)
[Environ. Eng. Sci. Prog., Manhattan Coll., Bronx, NY 10471]

81-002312 Walker, T. I. MERCURY CONTENT OF EDIBLE FLESH FROM SNAPPER, *CHRYSOPHRYS AURATUS* (BLOCH & SCHNEIDER), IN THE VICTORIAN COMMERCIAL CATCH. *Aust. J. Mar. Freshwater Res.* 32(1):75-92. 1981. SFA 26(3)
[Commer. Fish. Br., Fish Wildl. Br., Minist. Conserv., P.O. Box 41, East Melbourne, Victoria 3002, Australia] The concentrations of total mercury (range 0.1-1.5µg/g) in 40 individual snapper, *C. auratus*, caught in two commercial fishing areas in Victorian waters were adequately correlated with fork length by a power-law relationship. From further relationships established between length and total weight, and between filleted weight and total weight, the mean mercury concentration in the edible flesh of this species was estimated for each of the six years (1973-78) for which information on the length-frequency distribution was available for the Victorian commercial catch. The annual estimates ranged from 0.47 to 0.52µg/g wet weight, and 45-52% of the edible flesh had values exceeding the Victorian statutory limit of 0.5µg/g. Various management options available to health and fisheries agencies are discussed, and the methods of calculating the important parameters corresponding to these options are described. For example, graphs are presented from which can be read a legal maximum length of landed snapper, designed to reduce the mean mercury concentration of the catch to below a nominated level.

POLLUTION (CONTINUED)

81-002313 Watling, R. J.; T. P. McClurg and R. C. Stanton. RELATION BETWEEN MERCURY CONCENTRATION AND SIZE IN THE MAKO SHARK. *Bull. Environ. Contam. Toxicol.* 26(3):352-358. Mar. 1981. SFA 26(3)
[Zool. Dep., Univ. Port Elizabeth, P.O. Box 1600, Port Elizabeth 600, South Africa]

81-002314 Welch, K. J.; D. W. Kuehl; E. N. Leonard; G. D. Veith and N. D. Schoenthal. BACKGROUND HYDROCARBON RESIDUES IN FISHES FROM THE GREAT LAKES AND EASTERN MONTANA. *Bull. Environ. Contam. Toxicol.* 26(6):724-728. June 1981. SFA 26(3)
[S.C. Johnson and Son, Inc., Racine, WI 53403]

81-002315 Wilson, D.; B. Finlayson and N. Morgan. COPPER, ZINC, AND CADMIUM CONCENTRATIONS OF RESIDENT TROUT RELATED TO ACID-MINE WASTES. *Calif. Fish Game* 67(3):176-186. July 1981. SFA 26(3)
[Calif. Dep. Fish Game, 627 Cypress Ave., Redding 96001]

81-002316 Yanagishi, T.; T. Miyazaki; S. Horii and S. Kaneko. IDENTIFICATION OF MUSK XYLENE AND MUSK KETONE IN FRESHWATER FISH COLLECTED FROM THE TAMA RIVER, TOKYO. *Bull. Environ. Contam. Toxicol.* 26(5):656-662. May 1981. SFA 26(3)
[Tokyo Metro. Res. Lab. Publ. Health 24-1, 3-chome, Hyakunincho, Shinjuku-ku, Tokyo, 160 Japan]

FISH KILLS

81-002317 Kilikidis, S. D.;. A. P. Kamarianos, T. Kousouris and I. Tsingkounakis. INVESTIGATION ON THE CAUSE OF A FISH-KILL (*EPINEPHELUS*) IN THE KISAMOS GULF, CRETE. *Bull. Environ. Contam. Toxicol.* 26(4):453-460. Apr. 1981. SFA 26(3)
[Dep. Food Hygiene, Fac. Med., Aristotelian Univ., Thessaloniki, Greece]

TOXICOLOGY; BIOASSAYS

81-002318 Bermingham, N.; C. Blaise; P. Couture; B. Hummel; G. Joubert and M. Speyer, (eds.). COMPTE-RENDU DES COMMUNICATIONS DU SEPTIÈME ATELIER ANNUEL SUR LA TOXICITÉ AQUATIQUE: LE 5 À 7 NOVEMBRE 1980 MONTRÉAL (QUÉBEC). [PROCEEDINGS OF THE SEVENTH ANNUAL AQUATIC TOXICITY WORKSHOP: NOVEMBER 5-7, 1980 MONTREAL, QUEBEC.] *Can. Tech. Rep. Fish. Aquatic Sci.* no. 990. xiii + 519p. Mar. 1981. In English with French summ. SFA 26(3)
A collection of papers.--RS

81-002319 Billard, R. EFFECT OF SOME FISH ANESTHETICS ON GAMETE SURVIVAL DURING ARTIFICIAL INSEMINATION OF RAINBOW TROUT. *Prog. Fish-Cult.* 43(2):72-73. Apr. 1981. SFA 26(3)
[Lab. Physiol. Poissons, Natl. Rech. Agron., F-78350 Jouy en Josas, France]

TOXICOLOGY; BIOASSAYS (CONTINUED)

81-002320 Buccafusco, R. J.; S. J. Ells and G. A. LeBlanc. ACUTE TOXICITY OF PRIORITY POLLUTANTS TO BLUEGILL (*LEPOMIS MACROCHIRUS*). *Bull. Environ. Contam. Toxicol.* 26(4):446-452. Apr. 1981. SFA 26(3)
[Allied Chemical Corp., Morristown, NJ 07960] Industrially used chemicals are potential sources of contamination of the aquatic environment either through normal usage, disposal, or accidental spillage. To properly evaluate the potential hazards of these materials to the aquatic environment, toxicity tests must be conducted with aquatic organisms. Data derived from toxicity tests are used by the United States Environmental Protection Agency to develop water quality criteria for such chemicals. The purpose of this study was to determine the acute toxicity of selected priority pollutants to bluegill (*Lepomis macrochirus*).

81-002321 Buckler, D. R.; A. Witt, Jr.; F. L. Mayer and J. N. Huckins. ACUTE AND CHRONIC EFFECTS OF KEPONE AND MIREX ON THE FATHEAD MINNOW. *Trans. Am. Fish. Soc.* 110(2):270-280. Mar. 1981. SFA 26(3)
[U.S. FWS, Columbia Natl. Fish. Res. Lab., Columbia, MO 65201]

81-002322 Cameron, A. M.; J. Surridge; W. Stablum and R. J. Lewis. A CRINOTOXIN FROM THE SKIN TUBERCLE GLANDS OF A STONEFISH (*SYNANCEIA TRACHYNIS*). *Toxicon* 19(1):159-170. 1981. SFA 26(3)
[Dep. Zool., Univ. Queensland, St. Lucia, Brisbane 4067, Australia]

81-002323 Colt, J.; R. Ludwig; G. Tchobanoglous and J. J. Cech, Jr. THE EFFECTS OF NITRITE ON THE SHORT-TERM GROWTH AND SURVIVAL OF CHANNEL CATFISH, *ICTALURUS PUNCTATUS*. *Aquaculture* 24(1-2):111-122. May 1981. SFA 26(3)
[Dep. Civil Eng., Univ. Calif., Davis 95616] The effect of nitrite on the growth and survival of juvenile channel catfish (*Ictalurus punctatus*) was evaluated in a 31 day growth trial. The growth of the juvenile fish was reduced at Nitrite-N levels of 1.60 mg/l and above. Mortality was increased significantly at 3.17 mg/l Nitrite-N and above. The reduction in growth at the highest nitrite concentration without mortality was only 20%. The growth response of the fish at nitrite concentration levels with significant mortality was extremely variable.

81-002324 Cravedi, J. P. and J. Tulliez. DISTRIBUTION AND ELIMINATION ROUTES OF A NAPHTHENIC HYDROCARBON (DODECYLCYCLOHEXANE) IN RAINBOW TROUT (*SALMO GAIRDNERI*). *Bull. Environ. Contam. Toxicol.* 26(3):337-344. Mar. 1981. SFA 26(3)
[Lab. Rech. Additifs Aliment., I.N.R.A., 180 Chemin de Tournefeuille, 31300 Toulouse, France]

81-002325 Daniels, R. E. and J. D. Allan. LIFE TABLE EVALUATION OF CHRONIC EXPOSURE TO A PESTICIDE. *Can. J. Fish. Aquatic Sci.* 38(5):485-494. May 1981. In English with French summ. SFA 26(3)
[Savannah River Ecol. Lab., Drawer E, Aiken, SC 29801]

81-002326 Dave, G.; K. Andersson; R. Berglind and B. Hasselrot. TOXICITY OF EIGHT SOLVENT EXTRACTION CHEMICALS AND OF CADMIUM TO WATER FLEAS, *DAPHNIA MAGNA*, RAINBOW TROUT, *SALMO GAIRDNERI*, AND ZEBRAFISH, *BRACHYDANIO RERIO*. *Comp. Biochem. Physiol. C Comp. Pharmacol.* 69(1):83-98. 1981. SFA 26(3)
[Dep. Zoophysiol., Univ. Göteborg, Box 250 59, 400 31 Göteborg, Sweden] The toxicity of 8 solvent extraction chemicals (Primen JM-T, Amberlite LA-1, Adogen 283, Adogen 383, Alamine 336, TBP and HDEHP) and of cadmium has been investigated in neonates of water fleas, *Daphnia magna*,

TOXICOLOGY; BIOASSAYS (CONTINUED)

81-002326 CONTINUED embryos and larvae of rainbow trout, *Salmo gairdneri*, and in embryos, larvae and juveniles of zebrafish, *Brachydanio rerio*. The importance of the threshold value for comparisons of toxicity data is discussed and the possibility of its determination at elevated temperature is suggested. The toxicity data for cadmium, 48 hr LC_{50} for water fleas 69µg Cd/l and embryo-larval toxicity for rainbow trout 5.0µg Cd/l, agreed with previously reported data.

81-002327 Denison, M. S.; J. E. Chambers and J. D. Yarbrough. PERSISTENT VITELLOGENIN-LIKE PROTEIN AND BINDING OF DDT IN THE SERUM OF INSECTICIDE-RESISTANT MOSQUITOFISH *(GAMBUSIA AFFINIS)*. *Comp. Biochem. Physiol. C Comp. Pharmacol.* 69(1):109-112. 1981. SFA 26(3)
[Dep. Biol. Sci., Miss. State Univ., Mississippi State 39762]

81-002328 Dixon, D. G. and J. B. Sprague. ACCLIMATION-INDUCED CHANGES IN TOXICITY OF ARSENIC AND CYANIDE TO RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON. *J. Fish Biol.* 18(5):579-589. May 1981. SFA 26(3)
[Great Lakes Biolimnol. Lab., Burlington, ON L7R 4A6, Canada] Pre-exposure of rainbow trout, *Salmo gairdneri*, to sublethal levels of arsenic or cyanide, resulted in significant changes in the incipient lethal levels of the respective toxicants. Fish gradually increased their tolerance to arsenic (as arsenite) by 47% during a three week pre-exposure to 0.22 of the incipient lethal level. Mean whole-body aresenic concentrations increased from 2 to 27µg/g dry weight during the first week, then decreased to a stable level of 15 after two and three weeks. Fish decreased their tolerance to cyanide (as HCN) by 32 and 15% after one and two weeks of pre-exposure to 0.35 of the incipient lethal level. This initial sensitization disappeared after three weeks. Renal tubular parenchymatous oedema was observed after two and three weeks of cyanide pre-exposure. Neither arsenic nor cyanide affected growth at these levels of pre-exposure.

81-002329 Elner, J. K. and D. J. Wildish. SEASONAL DATA ON THE MICROBIAL COMMUNITY OF FOUR NEW BRUNSWICK PONDS, INCLUDING A PERIOD OF EXPERIMENTAL SPRAYING WITH MATACIL ®. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 993. iii + 21p. Jan. 1981. In English with French summ. SFA 26(3)
[Biol. Stn., St. Andrews, NB E0G 2X0, Canada] Four ponds in New Brunswick were selected on the basis of similarities in physicochemical parameters and biological communities to test the effect of Matacil ® on aquatic microbiology. Three ponds were sprayed in May 1980 with 140, 280 and 700 g Matacil ®/hectare, respectively, and the fourth pond was a control. This report follows the seasonal microbiological cycle of these ponds from September 1979-September 1980. Even at 700 g/ha, Matacil ® was found to have little effect on pond microbiology. All the ponds exhibited the unusual phenomenon of a winter maximum in algal numbers during a period of ice cover.

81-002330 Eurell, J. A. and W. E. Haensly. THE EFFECTS OF EXPOSURE TO WATER-SOLUBLE FRACTIONS OF CRUDE OIL ON SELECTED HISTOCHEMICAL PARAMETERS OF THE LIVER OF ATLANTIC CROAKER, *MICROPOGON UNDULATUS* L. *J. Fish Dis.* 4(3):187-194. May 1981. SFA 26(3)
[Box J-144, JHMHC, Univ. Fla., Gainesville 32610]

81-002331 Geen, G. H.; M. A. Hussain; P. C. Oloffs and B. A. McKeown. FATE AND TOXICITY OF ACEPHATE (ORTHENE ®) ADDED TO A COASTAL B. C. STREAM. *J. Environ. Sci. Health B Pestic. Food Contam. Agric. Wastes (Marceldekker, Inc., N.Y.)* 16(3):253-271. 1981. SFA 26(3)
[Dep. Biol. Sci., Simon Fraser Univ., Burnaby, BC V5A 1S6, Canada] Acephate was added to a small, coastal B. C. stream to yield a concentration of

TOXICOLOGY; BIOASSAYS (CONTINUED)

81-002331 CONTINUED 1100-1200 ppb for a 5-h period. It was rapidly taken up by fish, sediments, insect nymphs and larvae. No fish or insect mortality was noted although the more toxic methamidophos was found in both groups of animals. Acephate and methamidophos residues in animals and sediments declined to trace or non-detectable levels in 24h and to these levels in water by 96h. The impact of acephate on the stream and its fauna was limited and localized.

81-002332 Henderson, V.; J. W. Fisher and R. D'Allessandris. TOXIC AND TERATOGENIC EFFECTS OF HYDRAZINE ON FATHEAD MINNOW (*PIMEPHALES PROMELAS*) EMBRYOS. *Bull. Environ. Contam. Toxicol.* 26(6):807-812. June 1981. SFA 26(3)
[Biol. Dep., Grambling State Univ., Grambling, LA 71245]

81-002333 Könemann, H. QUANTITATIVE STRUCTURE-ACTIVITY RELATIONSHIPS IN FISH TOXICITY STUDIES. PART I. RELATIONSHIP FOR 50 INDUSTRIAL POLLUTANTS. *Toxicology* 19(3):209-221. 1981. SFA 26(3)
[Minist. Health Environ. Prot., P.O. Box 439, 2260 AK Leidschendam, The Netherlands]

81-002334 Könemann, H. FISH TOXICITY TESTS WITH MIXTURES OF MORE THAN TWO CHEMICALS: A PROPOSAL FOR A QUANTITATIVE APPROACH AND EXPERIMENTAL RESULTS. *Toxicology* 19(3):229-238. 1981. SFA 26(3)
[Minist. Health Environ. Prot., P.O. Box 439, 2260 AK Leidschendam, The Netherlands]

81-002335 Könemann, H. and A. Musch. QUANTITATIVE STRUCTURE-ACTIVITY RELATIONSHIPS IN FISH TOXICITY STUDIES. PART II: THE INFLUENCE OF pH ON THE QSAR OF CHLOROPHENOLS. *Toxicology* 19(3):223-228. 1981. SFA 26(3)
[Minist. Health Environ. Prot., P.O. Box 439, 2260 AK Leidschendam, The Netherlands]

81-002336 Kent, J. C. THE EFFECT OF RAFT RIVER GEOTHERMAL WATER AND AN ANTI-CORROSIVE, POTASSIUM DICHROMATE, ON THE IMMUNE RESPONSE OF THE CHANNEL CATFISH (*ICTALURUS PUNCTATUS*). *Ph.D. dissertation, Idaho State Univ.* 144p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(11):4033. May 1981. SFA 26(3)

81-002337 Lehtinen, K.-J. and A. Oikari. SUBLETHAL EFFECTS OF KRAFT PULP MILL WASTE WATER ON THE PERCH, *PERCA FLUVIATILIS*, STUDIED BY ROTARY-FLOW AND HISTOLOGICAL TECHNIQUES. *Ann. Zool. Fenn.* 17(4):255-259. 1980. SFA 26(3)
[Swedish Water Air Pollut. Res. Lab. (IVL), Baltic Sea Lab., Studsvik, S-611 82 Nyköping, Sweden] One-year-old perch were semistatically exposed for 14 days in 1,2 and 4% (v/v) concentrations of total, unfiltered, bleached, kraft pulp mill waste water. The fish were tested with the rotatory-flow technique before and after exposure. In the two highest concentrations the perch displayed significantly impaired ability to compensate in the rotatory-flow test compared to the control perch. However, no difference was observed between the two highest effective test concentrations. Histological analysis of liver showed hepatocytes with pycnotic nuclei, particularly in connection with the central veins. Increased cytoplasmic granularity with lysosome-sized particles was also discernible.

TOXICOLOGY; BIOASSAYS (CONTINUED)

81-002337 CONTINUED Apically swollen secondary lamellae occasionally occurred in the gills. In addition, parasitic cysts were found between the secondary lamellae in all exposed fish but not in the controls.

81-002338 Lock, R. A. C. and A. P. van Overbeeke. EFFECTS OF MERCURIC CHLORIDE AND METHYLMERCURIC CHLORIDE ON MUCUS SECRETION IN RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON. *Comp. Biochem. Physiol. C Comp. Pharmacol.* 69(1):67-73. 1981. SFA 26(3)
[Dep. Zool., Univ. Nijmegen, Toernooiveld, 6525 ED Nijmegen, The Netherlands]

81-002339 Matthiessen, P. HAEMATOLOGICAL CHANGES IN FISH FOLLOWING AERIAL SPRAYING WITH ENDOSULFAN INSECTICIDE FOR TSETSE FLY CONTROL IN BOTSWANA. *J. Fish Biol.* 18(4):461-469. Apr. 1981. SFA 26(3)
[Cent. Overseas Pest Res., Overseas Dev. Admin., College House, Wrights Lane, London W8 5SJ, England] Endosulfan, an insecticide highly toxic to fish, is currently applied from the air for tsetse fly control in the Okavango Delta, Botswana. Although dosages are very low (6-12 g a.i./ha), they cause some fish mortality and affect the behaviour of survivors. In order to determine how quickly fish recover from sub-lethal poisoning, four haematological characteristics (erythrocyte count, leucocyte count, haemoglobin concentration and plasma protein concentration) were monitored in several species during and after six sequential applications of endosulfan (July-October 1978). In all cases, blood cell counts were significantly elevated during spraying (by up to a factor of four), while plasma protein levels were often disturbed. Total haemoglobin (Hb) did not change, but the mean weight of Hb per erythrocyte declined significantly in *Tilapia* spp. from 59 to 39 pg. In most instances these quantities began returning to normal before spraying ceased and reached pre-spray levels within six months.

81-002340 Mattice, J. S.; S. C. Tsai; M. B. Burch and J. J. Beauchamp. TOXICITY OF TRIHALOMETHANES TO COMMON CARP EMBRYOS. *Trans. Am. Fish. Soc.* 110(2):261-269. Mar. 1981. SFA 26(3)
[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

81-002341 Moles, A.; S. Bates; S. D. Rice and S. Korn. REDUCED GROWTH OF COHO SALMON FRY EXPOSED TO TWO PETROLEUM COMPONENTS, TOLUENE AND NAPHTHALENE, IN FRESH WATER. *Trans. Am. Fish. Soc.* 110(3):430-436. May 1981. SFA 26(3)
[NMFS, P.O. Box 155, Auke Bay, AK 99821]

81-002342 Mulla, M. S.; H. A. Darwazeh and M. S. Dhillon. IMPACT AND JOINT ACTION OF DECAMETHRIN AND PERMETHRIN AND FRESHWATER FISHES ON MOSQUITOES. *Bull. Environ. Contam. Toxicol.* 26(5):689-695. May 1981. SFA 26(3)
[Dep. Entomol., Univ. Calif., Riverside 92521]

81-002343 Muramoto, S. INFLUENCE OF COMPLEXANS (EDTA, DTPA) ON THE TOXICITY OF CADMIUM TO FISH AT CHRONIC LEVELS. *Bull. Environ. Contam. Toxicol.* 26(5):641-646. May 1981. SFA 26(3)
[Inst. Agric. Biol. Sci., Okayama Univ., 2-20-1 Chu-o, Kurashiki, 710 Japan]

81-002344 Owen, J. W. and S. W. Rosso. EFFECTS OF SUBLETHAL CONCENTRATIONS OF PENTACHLOROPHENOL ON THE LIVER OF BLUEGILL SUNFISH, *LEPOMIS MACROCHIRUS*. *Bull. Environ. Contam. Toxicol.* 26(5):594-600. May 1981. SFA

TOXICOLOGY; BIOASSAYS (CONTINUED)

81-002344 CONTINUED 26(3)
[Dep. Biol., Univ. South. Miss., Hattiesburg 39401]

81-002345 Pan-Hou, H. S. K. and N. Imura. BIOTRANSFORMATION OF MERCURIALS BY INTESTINAL MICROORGANISMS ISOLATED FROM YELLOWFIN TUNA. *Bull. Environ. Contam. Toxicol.* 26(3):359-363. Mar. 1981. SFA 26(3)
[Sch. Pharm. Sci., Kitasato Univ. 9-1, Shirokane 5-Chome, Minato-Ku, Tokyo 108, Japan]

81-002346 Phipps, G. L.; G. W. Holcombe and J. T. Fiandt. ACUTE TOXICITY OF PHENOL AND SUBSTITUTED PHENOLS TO THE FATHEAD MINNOW. *Bull. Environ. Contam. Toxicol.* 26(5):585-593. May. 1981. SFA 26(3)
[U.S. EPA, 6201 Congdon Blvd., Duluth, MN 55804]

81-002347 Rath, S. and B. N. Misra. TOXICOLOGICAL EFFECTS OF DICHLORVOS (DDVP) ON BRAIN AND LIVER ACETYLCHOLINESTERASE (AChE) ACTIVITY OF *TILAPIA MOSSAMBICA*, PETERS. *Toxicology* 19(3):239-245. 1981. SFA 26(3)
[Lab. Environ. Toxicol., Dep. Botany, Berhampur Univ., Berhampur-760007, Orissa, India]

81-002348 Russo, R. C.; R. V. Thurston and K. Emerson. ACUTE TOXICITY OF NITRITE TO RAINBOW TROUT (*SALMO GAIRDNERI*): EFFECTS OF pH, NITRITE SPECIES, AND ANION SPECIES. *Can. J. Fish. Aquatic Sci.* 38(4):387-393. Apr. 1981. In English with French summ. SFA 26(3)
[Fish. Bioassay Lab., Mont. State Univ., Bozeman 59717]

81-002349 Sudershan, P. and M. A. Q. Khan. METABOLISM OF [^{14}C] DIELDRIN IN BLUEGILL FISH. *Pestic. Biochem. Physiol.* 15(2):192-199. Apr. 1981. SFA 26(3)
[Res. Dep., Ill. State Psychiatric Inst., 1601 W. Taylor St., Chicago 60612]

81-002350 Tan, B. and P. Melius. RESPONSES OF THE HEPATIC ENZYMES OF A TELEOST FISH TO *TRANS*-STILBENE OXIDE TREATMENT. *Bull. Environ. Contam. Toxicol.* 26(6):801-806. June 1981. SFA 26(3)
[Dep. Chem., Auburn Univ., Auburn, AL 36849]

81-002351 U.S. Fish and Wildlife Service. CHLORINATED HYDROCARBONS AS A FACTORS IN THE REPRODUCTION AND SURVIVAL OF LAKE TROUT (*SALVELINUS NAMAYCHUS*) IN LAKE MICHIGAN. *U.S. Fish Wildl. Serv. Tech. Pap.* 105. 42p. 1981. A collection of papers.--RS.

81-002352 Verma, S. R.; S. Rani and R. C. Dalela. SYNERGISM, ANATAGONISM, AND ADDITIVITY OF PHENOL, PENTACHLOROPHENOL, AND DINITROPHENOL TO A FISH (*NOTOPTERUS NOTOPTERUS*). *Arch. Environ. Contam. Toxicol.* 10(3):365-370. 1981. SFA 26(3)
[Pollut. Relevant Res. Lab., P.O. Box 264, Post-grad. Dep. Zool., D.A.V. Coll., Muzaffarnagar-251001, India]

TOXICOLOGY; BIOASSAYS (CONTINUED)

81-002353 Vodicnik, M. J.; C. R. Elcombe and J. J. Lech. THE EFFECT OF VARIOUS TYPES OF INDUCING AGENTS ON HEPATIC MICROSOMAL MONOOXYGENASE ACTIVITY IN RAINBOW TROUT. *Toxicol. Appl. Pharmacol.* 59(2):364-374. 30 June 1981. SFA 26(3)
[Dep. Pharmacol. Toxicol., Med. Coll. Wisc., Milwaukee 53226]

81-002354 Williams, H. A. and R. Wootten. SOME EFFECTS OF THERAPEUTIC LEVELS OF FORMALIN AND COPPER SULPHATE ON BLOOD PARAMETERS IN RAINBOW TROUT. *Aquaculture* 24(3-4):341-353. June 1981. SFA 26(3)
[Mar. Lab., P.O. Box 101, Aberdeen AB9 8DB, Scotland] The effects of standard copper sulphate (0.5 ppm) and formalin (200 ppm) bath treatments on haematocrit values, total haemoglobin, blood glucose and the activity of lactate dehydrogenase (LDH), hydroxybutyric dehydrogenase (HBDH), glutamate pyruvate transaminase (GPT) and glutamate oxaloacetate transaminase (GOT) in the plasma from apparently healthy rainbow trout are described. A single copper sulphate treatment produced statistically significant increases in mean values of all parameters measured. GPT activity showed the greatest increase, two-fold, and was still elevated after 24h. Formalin only significantly affected haematocrit (Hct) and GOT activity. The results of clinical tests are correlated with a study of short term changes in liver histopathology. Recovery after single treatment and degenerative changes resulting from repeating treatments are described. Implications for defining treatment regimes to minimize chemotherapeutic stress are considered.

81-002355 Wong, P. T. S.; Y. K. Chau; O. Kramar and G. A. Bengert. ACCUMULATION AND DEPURATION OF TETRAMETHYLLEAD BY RAINBOW TROUT. *Water Res.* 15(5):621-625. 1981. SFA 26(3)
[Can. Cent. Inland Waters, P.O. Box 5050, Burlington, ON L7R 4A6, Canada]

81-002356 Woodward, D. F.; P. M. Mehrle, Jr. and W. L. Mauck. ACCUMULATION AND SUBLETHAL EFFECTS OF A WYOMING CRUDE OIL IN CUTTHROAT TROUT. *Trans. Am. Fish. Soc.* 110(3):437-445. May 1981. SFA 26(3)
[Columbia Natl. Fish. Res. Lab., P.O. Box 1089, Jackson, WY 83001]

81-002357 Yamaguchi, K.; K. Ogawa; N. Takeda; K. Hashimoto and T. Okaichi. OXYGEN EQUILIBRIA OF HEMOGLOBINS OF CULTURED SEA FISHES, WITH SPECIAL REFERENCE TO RED TIDE-ASSOCIATED MASS MORTALITY OF YELLOWTAIL. *Bull. Jpn. Soc. Sci. Fish.* 47(3):403-409. Mar. 1981. SFA 26(3)
[Lab. Mar. Biochem., Fac. Agric., Univ. Tokyo, Bunkyo-ku, Tokyo 113, Japan]

RESEARCH AND MANAGEMENT-GENERAL

81-002358 Everhart, W. H. and W. D. Youngs. PRINCIPLES OF FISHERY SCIENCE. *Cornell Univ. Press, Ithaca, NY* 349p. 1981. Available @ $16.50 from Cornell Univ. Press, 124 Roberts Place, Ithaca, NY 14850]

81-002359 FAO of the UN. REPORT ON THE FAO/UNEP WORKSHOP ON THE AQUATIC SCIENCES AND FISHERIES INFORMATION SYSTEM (ASFIS) CARTAGENA, COLOMBIA, 3-14 DECEMBER 1979. *FAO Fish. Rep.* No. 243. viii + 43p. 1980. SFA 26(3)
[Rome, Italy]

RESEARCH AND MANAGEMENT-GENERAL (CONTINUED)

81-002360 FAO of the UN. REPORT OF THE FAO EXPERT CONSULTATION ON FISH TECHNOLOGY IN AFRICA. DAR-ES-SALAAM, TANZANIA, 11-15 FEBRUARY 1980. *FAO Fish. Rep.* No. 237. vii + 18p. 1980. SFA 26(3)
[Rome, Italy]

81-002361 FAO of the UN. INTERNATIONAL DIRECTORY OF FISH TECHNOLOGY INSTITUTES. *FAO Fish. Tech. Pap.* No. 152 (Revision 1). x + 106p. 1980. SFA 26(3)
[Rome, Italy]

81-002362 Lusk, S. UTILIZATION OF THE PRODUCTIVITY AND FISH STOCKS OF FREE WATERS OF CZECHOSLOVAKIA. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 79-82. 1981. SFA 26(3)
[Inst. Vert. Zool., Czech. Acad. Sci., Brno, Czechoslovakia]

81-002363 Peterson, N. WORTHY OF "EXTRA SPECIAL CONCERN." *Mont. Outdoors* 12(4):14-17. July-Aug. 1981. SFA 26(3)
[226 Meadow Dr., Helena, MT 59601]

ADMINISTRATION AND PLANNING

81-002364 Fraser, G. A. and M. J. Friedlaender. SOCIAL IMPACTS AND ECONOMIC EFFICIENCY IN RESOURCE DEVELOPMENT PLANNING: THE CASE OF SALMONID ENHANCEMENT ON CANADA'S PACIFIC COAST. *Can. Dep. Fish. Oceans Tech. Rep.* no. 923. v + 20p. Sept. 1980. In English with French summ. SFA 26(3)
[Dep. Fish. Oceans, 1090 W. Pender St., Vancouver, BC V6E 2P1, Canada] Social impacts associated with the Federal Government's Salmonid Enhancement Program in British Columbia are mainly beneficial, but their magnitude and distribution are strongly influenced by program planning choices. Social impact assessment can, accordingly, play a constructive role during the planning of this resource development program. However, rational decision making requires an analysis of the economic efficiency costs of pursuing social objectives as well as the distributional and quality of life costs of pursuing economic efficiency objectives. Whether social benefits outweigh the associated economic costs remains a matter of judgement in each particular case. Concrete examples illustrate how these ideas have been implemented in the Salmonid Enhancement Program's planning process.

81-002365 Grofit, E. A GUIDE FOR THE PLANNING, ESTABLISHMENT AND OPERATION OF NATIONAL FISHING TECHNOLOGY SERVICES IN DEVELOPING FISHERIES. *FAO Fish. Tech. Pap.* No. 199. ix + 48p. 1980. SFA 26(3)
[FAO of the UN, Rome, Italy]

REPORTS OF FISHERY STATIONS, STATES, ETC.

81-002366 Foyle Fisheries Commission. THE FOYLE FISHERIES COMMISSION TWENTY-EIGHTH ANNUAL REPORT FOR 1979. *Foyle Fish. Comm. Annu. Rep.* 28:1-46. 31 Mar. 1980. SFA 26(3)
[Belfast, Northern Ireland]

REPORTS OF FISHERY STATIONS, STATES, ETC. (CONTINUED)

81-002367 International Council for the Exploration of the Sea. REPORTS OF THE ICES ADVISORY COMMITTEE ON FISHERY MANAGEMENT, 1980. *Int. Counc. Explor. Sea Coop. Res. Rep.* No. 102. 235p. 1980. SFA 26(3)
[Palaegade 2-4, 1261 Copenhagen K, Denmark]

HABITAT ALTERATIONS

81-002368 Haefner, J. D. and J. B. Wallace. SHIFTS IN AQUATIC INSECT POPULATIONS IN A FIRST-ORDER SOUTHERN APPALACHIAN STREAM FOLLOWING A DECADE OF OLD FIELD SUCCESSION. *Can. J. Fish. Aquatic Sci.* 38(3):353-359. Mar. 1981. In English with French summ. SFA 26(3)
[Dep. Entomol., Mich. State Univ., East Lansing 48824]

81-002369 Martin, S. B. and W. S. Platts. EFFECTS OF MINING. *IN Influence of Forest and Rangeland Management on Anadromous Fish Habitat in Western North America. U.S. For. Serv. Gen. Tech. Rep.* PNW-124. 15p. 1981. SFA 26(3)
[U.S. For. Serv., 316 E. Myrtle St., Boise, ID 83706]

81-002370 Platts, W. S. EFFECTS OF LIVESTOCK. *IN Influence of Forest and Rangeland Management on Anadromous Fish Habitat in Western North America. U.S. For. Serv. Gen. Tech. Rep.* PNW-124. 25p. 1981. SFA 26(3)
[U.S. For. Serv., 316 E. Myrtle St., Boise, ID 83706]

81-002371 Snigg, M. BOULDERS FOR THE GREEN. *Wyo. Wildl.* 45(5):18-21. May 1981. SFA 26(3)
[P.O. Box 92, Green River, WY 82935]

81-002372 Trjapicyna, L. N. and L. P. Kizina. ECOLOGY OF CYPRINID FISHES IN THE VOLGA DELTA UNDER REGULATED RUN-OFF CONDITIONS. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 143-147. 1981. SFA 26(3)
[A.N. Severcov Inst. Evol. Anim. Morphol. Ecol., USSR Acad. Sci., Moscow, USSR]

81-002373 Wilson, J. BRINGING FISH AND FISHERMEN TOGETHER. *Ky. Happy Hunting Ground* 37(3):9-13. May-June 1981. SFA 26(3)

HARVEST, CREEL CENSUS, ETC.

81-002374 Beardsley, G. L. and R. J. Conser. AN ANALYSIS OF CATCH AND EFFORT DATA FROM THE U.S. RECREATIONAL FISHERY FOR BILLFISHES (ISTIOPHORIDAE) IN THE WESTERN NORTH ATLANTIC OCEAN AND GULF OF MEXICO, 1971-78. *NOAA Fish. Bull.* 79(1):49-68. Jan. 1981. SFA 26(3)
[NMFS, 75 Virginia Beach Dr., Miami, FL 33149]

HARVEST, CREEL CENSUS, ETC. (CONTINUED)

81-002375 Coetzee, P. S. and D. Baird. CATCH COMPOSITION AND CATCH PER UNIT EFFORT OF ANGLERS' CATCHES OFF ST CROIX ISLAND, ALGOA BAY. *S. Afr. J. Wildl. Res.* 11(1):14-20. 1981. In English with Afrikaans summ. SFA 26(3)
[Dep. Zool., Univ. Port Elizabeth, P.O. Box 1600, Port Elizabeth 6000, South Africa]

81-002376 FAO of the UN. 1979 YEARBOOK OF FISHERY STATISTICS. *FAO Fish. Ser.* 13. x + 384p. 1980. In English, French and Spanish. SFA 26(3):
[Rome, Italy]

81-002377 Groth, P. G. EFFECTIVE USE OF SOCIOCULTURAL DATA IN FISHERIES MANAGEMENT: A CASE STUDY. *Fisheries (Bull. Am. Fish. Soc.)* 6(2):11-16. Mar.-Apr. 1981. SFA 26(3)
[Dep. Sociol., La. State Univ., Baton Rouge 70803]

81-002378 Liao, D. S. and D. M. Cupka. SOCIO-ECONOMIC PROFILE OF SOUTH CAROLINA'S OFFSHORE SPORT FISHERMEN. *S.C. Mar. Resour. Cent. Tech. Rep.* No. 34. 9p. Apr. 1979. SFA 26(3)
[S.C. Wildl. Mar. Resour. Dep., Charleston 29412]

81-002379 Lusk, S. FISH AND FISHING IN THE SVRATKA AND SVITAVA RIVER SECTIONS WITHIN THE PRECINCTS OF BRNO. *Folia Zool.* 29(4):357-370. 1980. SFA 26(3)
[Inst. Vert. Zool., Czech. Acad. Sci., Brno, Czechoslovakia]

81-002380 Williams, M. SURVEY OF FISHING OPERATIONS IN QUEENSLAND. *Queensl. Fish. Serv. Tech. Rep.* No. 2. 34p. Nov. 1980. SFA 26(3)
[Queensland Fish. Serv., P.O. Box 36, North Quay, Brisbane, Queensland 4000, Australia]

REGULATIONS

81-002381 Jensen, A. L. OPTIMUM SIZE LIMITS FOR TROUT FISHERIES. *Can. J. Fish. Aquatic Sci.* 38(6):657-661. June 1981. In English with French summ. SFA 26(3)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109]

81-002382 Serns, S. L. EFFECTS OF A MINIMUM LENGTH LIMIT ON THE WALLEYE POPULATION OF WOLF LAKE, VILAS COUNTY, WISCONSIN. *Wis. Dep. Nat. Resour. Fish Manage. Rep.* 106. 11p. Apr. 1981. SFA 26(3)
[Box 440, Woodruff, WI 54568] A minimun size limit on walleyes (*Stizostedion vitreum vitreum*) in Wolf Lake was evaluated from 1971 to 1977. During 3 years with a 15-inch limit and 4 years with a 14-inch limit, the angler catch and yield of walleyes ≥15 inches varied from 0.47 to 1.88 walleyes/acre and 0.95 to 3.09 lb/acre, respectively. An increase in angler catch and yield of walleyes ≥15 inches in 1974 and 1975 was attributed to the recruitment of large 1969 and 1970 year classes. No correlation existed between angler catch of walleyes ≥15 inches and their density. The number of large walleyes in the angler catch increased during the study period as did the mean length and weight of angler-caught walleyes; however, large walleyes (≥20 inches) were not as vulnerable to angling as smaller ones (<20 inches). There was a slight reduction in growth and

REGULATIONS (CONTINUED)

81-002382 CONTINUED condition of walleyes after imposition of the size limit but instantaneous total and annual total mortality rates did not change appreciably. Population density and standing crop of walleyes during the first 2 and last 2 years of the study period (1971-77) were similar. The exploitation of walleyes ≥15 inches was low and not realted to their density. Large 1969 and 1970 year classes did not stockpile under the size limit as they had in a nearby lake after a size limit was established.

MARKING AND TAGGING

81-002383 Muncy, R. J. and A. P. D'Silva. MARKING WALLEYE EGGS AND FRY. *Trans. Am. Fish. Soc.* 110(2):300-305. Mar. 1981. SFA 26(3)
[Miss. Coop. Fish. Res. Unit, P.O. Drawer BX, Mississippi State 39762]

81-002384 Ross, M. J. and J. H. McCormick. EFFECTS OF EXTERNAL RADIO TRANSMITTERS ON FISH. *Prog. Fish-Cult.* 43(2):67-72. Apr. 1981. SFA 26(3)
[Univ. Minn., Dep. Ecol. Behav. Biol., Minneapolis 55455]

81-002385 Smith, A. K. and B. P. McPherson. COMPARISON OF T-BAR AND PETERSEN DISC TAG LOSS FROM CHINOOK SALMON (*ONCORHYNCHUS TSHAWYTSCHA*) IN THE ROGUE RIVER, OREGON. *Oreg. Dep. Fish Wildl. Inf. Rep. Ser. Fish.* no. 80-8. 14p. Feb. 1981. SFA 26(3)
[1050 N.W. Hillside Dr., Grants Pass, OR 97526] Loss of Floy T-Bar tags and Petersen disc tags was studied in the Rogue River on spring and fall chinook salmon tagged during their upstream migration. Petersen tags were lost throughout migration and spawning, but chinook lost T-bar tags primarily during spawning and/or after death. Adult spring chinook lost both types of tags at about the same rate (20-21%). However, fall chinook adults lost T-Bar tags at a greater rate (39%) than Petersen tags (10%). Jacks of both races lost Petersen tags at higher rates (33-50%) than T-bar tags (9-25%). Males of both races lost T-bar tags at higher rates (41-53%) than females (9-32%) or jacks (9-25%). Jacks lost Petersen tags at high rates (33-50%) than adults (0-29%). The adipose fin clip was a longer lasting secondary mark than opercular punches. Evaluation of tag loss, stratified by fish size, tagging site, recovery site, and possibly other strata is recommended. T-bar tags are recommended over Petersen tags in most situations.

STOCKING AND INTRODUCTIONS

81-002386 Cresswell, R. C. POST-STOCKING MOVEMENTS AND RECAPTURE OF HATCHERY-REARED TROUT RELEASED INTO FLOWING WATERS--A REVIEW. *J. Fish Biol.* 18(4):429-442. Apr. 1981. SFA 26(3)
[Amen. Fish. Recreation Dep., Yorkshire Water Auth., West Riding House, 67 Albion St., Leeds LS1 5AA, England] The success of stocking with hatchery-reared trout has been the subject of varied investigations for the past half-century. Percentage returns are summarised, and literature on the post-stocking movements of hatchery-reared trout is reviewed. Factors affecting the post-stocking movements are considered, special attention being paid to studies on industrial rivers. Highest returns are obtained from stockings, with trout of a size suitable for angling, made during or shortly before the angling season. The majority of stocked brown trout, *Salmo trutta* tend to remain close to the area of stocking, but brook trout, *Salvelinus fontinalis* and rainbow trout, *Salmo gairdneri* show greater movements, usually in a down-stream direction. Greater dispersion of all

STOCKING AND INTRODUCTIONS (CONTINUED)

81-002386 CONTINUED species occurs if they have overwintered prior to capture or have been stocked in 'cold water' or in small upstream stretches of river.

81-002387 Fraser, F. J.; D. D. Bailey and M. J. Wood. BIG QUALICUM RIVER SALMON DEVELOPMENT PROJECT (VOLUME III). EXPERIMENTAL REARING OF CHUM SALMON JUVENILES (*ONCORHYNCHUS KETA*) IN FRENCH WATER (1968-70.). *Fish. Environ. Can. Fish. Mar. Serv. Tech. Rep.* No. 752. vii + 22p. Mar. 1978. In English with French summ. SFA 26(3)
[Fish. Mar. Serv., 1090 W. Pender St., Vancouver, BC V6E 2P1, Canada] During the spring of 1968, 1969 and 1970 chum juveniles from the Big Qualicum River system were captured and reared under semi-natural conditions for periods ranging from 38 to 54 days. Fry were fed Oregon Moist Pellet diet. A total of 3.9 million juveniles were returned to the system, averaging 2.10 g (six times heavier than normal migrant fry). Growth in weight ranged from 2.99 to 3.88%/day, wet weight food conversions from 1.87 to 2.99, and rearing mortalities from 14.9% to 48.9%. Fin-clips and oxytetracycline were used to mark reared groups. Release dates varied from June 5 to July 4. Migrant-to-adult survival for the 1968 brood was lower than wild survival (0.53% versus 0.65%) but survival for the 1969 brood was higher (0.94% versus 0.69%). Delay in juvenile release, relative to maximum local marine plankton abundance, is considered responsible for relatively low fingerling-to-adult survivals of reared groups.

81-002388 Martin, R. M.; W. R. Heard and A. C. Wertheimer. SHORT-TERM REARING OF PINK SALMON (*ONCHORHYNCHUS GORBUSCHA*) FRY: EFFECT ON SURVIVAL AND BIOMASS OF RETURNING ADULTS. *Can. J. Fish. Aquatic Sci.* 38(5):554-558. May 1981. In English with French summ. SFA 26(3)
[NMFS, P.O. Box 155, Auke Bay, AK 99821]

81-002389 Moksness, E. and V. Øiestad. MERKEFORSØK MED 0-GRUPPE KYSTTORSK (*GADUS MORHUA* L.) DRETTET OPP I ET UTENDØRS BASSENG. [TAGGING EXPERIMENTS ON 0-GROUP COASTAL COD (*GADUS MORHUA* L.) REARED IN AN OUTDOOR BASIN.] *Fisken Havet* 1980(4):11-20. 1980. In Norwegian with English summ. SFA 26(3)
[State Biol. Stn. Flødevigen, 4800 Arendal, Norway]

81-002390 Rukhlov, F. N. and O. S. Lyubayeva. THE RESULTS OF MARKING OF YOUNG PINK SALMON, *ONCORHYNCHUS GORBUSCHA*, IN THE SAKHALIN FISH HATCHERIES IN 1976. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(1):110-118. 1980. SFA 26(3)
[SakhTINRO, USSR]

FISHING GEAR AND TECHNIQUES

81-002391 Backiel, T. and R. L. Welcomme, (eds.). GUIDELINES FOR SAMPLING FISH IN INLAND WATERS. *EIFAC Tech. Pap.* no. 33. ix + 176p. 1980. SFA 26(3)
[FAO, Rome, Italy]

81-002392 Dlugokenski, C. and S. Hager. SALMON ADULTS AND SMOLTS SAMPLED IN A COASTAL WASHINGTON RIVER. *Prog. Fish-Cult.* 43(2):106-107. Apr. 1981. SFA 26(3)
[U.S. FWS, Fish. Assistance Off., Olympia, WA 98502]

FISHING GEAR AND TECHNIQUES (CONTINUED)

81-002393 Johnstone, A. D. F. and A. D. Hawkins. A METHOD FOR TESTING THE EFFECTIVENESS OF DIFFERENT FISHING BAITS IN THE SEA. *Scott. Fish. Inf. Pam.* No. 3. 7p. 1981. SFA 26(3)

81-002394 Saul, G. E. EFFECTS OF REPETITIVE ELECTROSHOCKING ON FISH POPULATIONS IN EXPERIMENTAL RACEWAYS AND A SMALL HEADWATER STREAM IN SOUTHERN WEST VIRGINIA. *Ph.D. dissertation, Va. Polytech. Inst. State Univ.* 152p. 1980. From Diss. Abstr. Int. B Sci. Eng. 41(12):4320. June 1981. SFA 26(3)

Fisheries scientists have utilized electrofishing extensively to sample and assess aquatic populations. The physiological responses of fish exposed to electroshock ranges from sensory recognition, through electrotaxis and electronarcosis, to death. This study examined the effects of repetitive electroshocking over time on population survival, and the effects of mortality on the estimation of population size using single census, multiple census and depletion techniques. This work has demonstrated that repetitive exposure to electroshocking induces mortality in a predictable manner of fish populations. Depletion estimates are usually accomplished with a much reduced expenditure of time and effort over mark-recapture methods, however, mortality can be expected due to repetitive electroshocking alone. Researchers are cautioned to examine the objectives of a particular study before deciding on a particular estimation techniques.--From abstr.

FERTILIZATION OF SOIL AND WATER

81-002395 Boyd, C. E. SOLUBILITY OF GRANULAR INORGANIC FERTILIZERS FOR FISH PONDS. *Trans. Am. Fish. Soc.* 110(3):451-454. May 1981. SFA 26(3)

[Dep. Fish. Allied Aquacult., Auburn Univ. Agric. Exp. Stn., Auburn, AL 36849]

81-002396 Kavalec, J. EFFECT OF FERTILIZATION AND FOOD ON THE PRODUCTION OF TILAPIA BY FISH CULTURE IN ZAMBIA. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 41-46. 1981. SFA 26(3)

[Cent. Comm. Czech. Anglers Union, Praha, Czechoslovakia]

81-002397 Shortreed, K. S. and J. G. Stockner. LIMNOLOGICAL RESULTS FROM THE 1979 BRITISH COLUMBIA LAKE ENRICHMENT PROGRAM. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 995. iv + 71p. Feb. 1981. In English with French summ. SFA 26(3)

[Dep. Fish. Oceans, 4160 Marine Dr., West Vancouver, BC V7V 1N6, Canada]

FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC.

81-002398 Barker, S. L.; D. W. Townsend and J. S. Hacunda. MORTALITIES OF ATLANTIC HERRING, *CLUPEA H. HARENGUS*, SMOOTH FLOUNDER, *LIOPSETTA PUTNAMI*, AND RAINBOW SMELT, *OSMERUS MORDAX*, LARVAE EXPOSED TO ACUTE

FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC. (CONTINUED)

81-002398 CONTINUED THERMAL SHOCK. *NOAA Fish. Bull.* 79(1):198-200. Jan. 1981. SFA 26(3)
[Dep. Oceanogr., Ira C. Darling Cent., Univ. Me., Walpole 04573]

81-002399 Boreman, J.; C. P. Goodyear and S. W. Christensen. AM EMPIRICAL METHODOLOGY FOR ESTIMATING ENTRAINMENT LOSSES AT POWER PLANTS SITED ON ESTUARIES. *Trans. Am. Fish. Soc.* 110(2):253-260. Mar. 1981. SFA 26(3)
[NMFS, Woods Hole, MA 02543]

81-002400 Comp, G. S. IMPINGEMENT OF FISHES AND INVERTEBRATES AT A POWER PLANT ON TAMPA BAY, FLORIDA. *Fla. Sci.* 44(Suppl. 1):22. 1981. Abstract only. SFA 26(3)
[Mote Mar. Lab., 1600 City Island Park, Sarasota, FL 33577] A total of 3087 fishes (51 species) and 4710 invertebrates (19 species) were collected on the traveling screens of one unit at the Big Bend Power Station during 576 hours of sampling. Samples were collected four times per day, once every two weeks between March 13, 1979 and February 12, 1980. Most of the animals (70.8% of the fishes and 62.0% of the invertebrates) were impinged between 1800 and 0600 hours. Impingement rates varied from 3.5 to 32 animals/hr through the year and correlated with seasonal changes in the relative abundance of animals within the sampling area.

81-002401 Libby, D. A. DIFFERENCE IN SEX RATIOS OF THE ANADROMOUS ALEWIFE, *ALOSA PSEUDOHARENGUS*, BETWEEN THE TOP AND BOTTOM OF A FISHWAY AT DAMARISCOTTA LAKE, MAINE. *NOAA Fish. Bull.* 79(1):207-211. Jan. 1981. SFA 26(3)
[Me. Dep. Mar. Resour., West Boothbay Harbor 04575]

81-002402 Schneeberger, P. J. and D. J. Jude. USE OF FISH LARVA MORPHOMETRY TO PREDICT EXCLUSION CAPABILITIES OF SMALL-MESH SCREENS AT COOLING-WATER INTAKES. *Trans. Am. Fish. Soc.* 110(2):246-252. Mar. 1981. SFA 26(3)
[Great Lakes Res. Div., Inst. Sci. Technol., Univ. Mich., Ann Arbor 48109]

81-002403 Van Winkle, W.; D. S. Vaughan; L. W. Barnthouse and B. L. Kirk. AN ANALYSIS OF THE ABILITY TO DETECT REDUCTIONS IN YEAR-CLASS STRENGTH OF THE HUDSON RIVER WHITE PERCH (*MORONE AMERICANA*) POPULATION. *Can. J. Fish. Aquatic Sci.* 38(6):627-632. June 1981. In English with French summ. SFA 26(3)
[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

MATHEMATICS, STATISTICAL METHODS, AND MODELING

81-002404 Beidler, W. M. and T. E. Nickelson. AN EVALUATION OF THE OREGON DEPARTMENT OF FISH AND WILDLIFE STANDARD SPAWNING FISH SURVEY SYSTEM FOR COHO SALMON. *Oreg. Dep. Fish Wildl. Inf. Rep. Sec. Fish.* no. 80-9. i + 23p. Dec. 1980. SFA 26(3)
The purpose of this study was to use existing data to: (1) evaluate the four principle assumptions underlying the ODFW standard spawning index; (2) to determine the precision of the present standard index and the sample size needed to achieve the desired level; (3) to determine the effect of hatchery fish on the standard index and (4) to recommend improvements for evaluating

MATHEMATICS, STATISTICAL METHODS, AND MODELING (CONTINUED)

81-002404 CONTINUED coho escapement to Oregon coastal streams. The results of this study indicate that the standard index should be expanded to at least 40 survey units, and the use of the peak count as an index of run size be eliminated and replaced with total fish-days or an estimate of the number of spawners. It was also found that the standard index appears to have been influenced by hatchery production. The use of spawning fish surveys as an absolute measure of abundance is discussed. It is recommended that the standard index be expanded to 40 units which are representative of all the coho habitat on the Oregon coast. It is further recommended that the expanded survey should emphasize streams which have not been heavily stocked with hatchery fish, or that a separate index for wild fish be established.

81-002405 Frolov, O. N. A SIMPLE ALGORITHM FOR CALCULATING THE RELATIVE ANNUAL RECRUITMENT. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 20(2):130-134. 1980. SFA 26(3)
[TINRO, Vladivostok, USSR]

81-002406 Hourston, A. S. and J. F. Schweigert. PROCEDURES FOR ASSESSING AND FORECASTING BRITISH COLUMBIA HERRING STOCKS FROM CATCH, SAMPLING, AND SPAWN DEPOSITION DATA. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1000. iv + 58p. Mar. 1981. In English with French summ. SFA 26(3)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

81-002407 Innis, G. S.; D. F. Hanson and J. W. Haefner. A SIMULATION MODEL OF MANAGEMENT ALTERNATIVES IN A FRESHWATER FISHERY. *Ecol. Model.* 12(4):267-280. May 1981. SFA 26(3)
[Dep. Wildl. Sci., Utah State Univ., Logan 84322] A model for investigating management alternatives on the Pyramid Lake-Truckee River system of Nevada and California is presented. Cutthroat trout, Cui-ui, Tahoe Sucker and Tui Chub are modeled with special emphasis on river spawning by trout. Management decision variables include hatchery input, water flow control, and diversion screening. Preliminary results indicate that some hatchery input will be needed to support the trout even with the best river management.

81-002408 Jensen, A. L. SAMPLE SIZES FOR SINGLE MARK AND SINGLE RECAPTURE EXPERIMENTS. *Trans. Am. Fish. Soc.* 110(3):455-458. May 1981. SFA 26(3)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109]

81-002409 Kappenman, R. F. A METHOD FOR GROWTH CURVE COMPARISONS. *NOAA Fish. Bull.* 79(1):95-101. Jan. 1981. SFA 26(3)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

81-002410 Levin, S. A. and C. P. Goodyear. ANALYSIS OF AN AGE-STRUCTURED FISHERY MODEL. *J. Math. Biol.* 12(2):263. June 1981. SFA 26(3)
[Sect. Ecol. Syst., Ithaca, NY 14850]

81-002411 Libosvárský, J. TWO EXAMPLES OF USING A MINICOMPUTER IN ZOOLOGICAL RESEARCH. *IN M. Peňáz and M. Prokeš, eds, Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 71-78. 1981. SFA 26(3)
[Inst. Vert. Zool., Czech. Acad. Sci., Brno, Czechoslovakia]

MATHEMATICS, STATISTICAL METHODS, AND MODELING (CONTINUED)

81-002412 Ludwig, D. and C. J. Walters. MEASUREMENT ERRORS AND UNCERTAINTY IN PARAMETER ESTIMATES FOR STOCK AND RECRUITMENT. *Can. J. Fish. Aquatic Sci.* 38(6):711-720. June 1981. In English with French summ. SFA 26(3)
[Dep. Math., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

81-002413 Majkowski, J. APPLICATION OF A MULTISPECIES APPROACH FOR ASSESSING THE POPULATION ABUNDANCE AND THE AGE-STRUCTURE OF FISH STOCKS. *Can. J. Fish. Aquatic Sci.* 38(4):424-431. Apr. 1981. In English with French summ. SFA 26(3)
[CSIRO, Div. Fish. Oceanogr., P.O. Box 21, Cronulla, N.S.W. 2230, Australia]

81-002414 Mendelssohn, R. USING BOX-JENKINS MODELS TO FORECAST FISHERY DYNAMICS: IDENTIFICATION, ESTIMATION, AND CHECKING. *NOAA Fish. Bull.* 78(4):887-896. Oct. 1980. SFA 26(3)
[NMFS, Honolulu Lab., Honolulu, HI 96812]

81-002415 Ralston, S. A MULTISPECIES PRODUCTION ANALYSIS OF HAWAII'S OFFSHORE HANDLINE FISHERY. *Pac. Sci.* 34(3):336. July 1980. Abstract only. SFA 26(3)
[Coll. Fish., Univ. Wash., Seattle]

81-002416 Smith, A. D. M. and C. J. Walters. ADAPTIVE MANAGEMENT OF STOCK-RECRUITMENT SYSTEMS. *Can. J. Fish. Aquatic Sci.* 38(6):690-703. June 1981. In English with French summ. SFA 26(3)
[Cent. Environ. Technol., Imperial Coll., London SW7 1LU, England]

81-002417 Walters, C. J. and D. Ludwig. EFFECTS OF MEASUREMENT ERRORS ON THE ASSESSMENT OF STOCK-RECRUITMENT RELATIONSHIPS. *Can. J. Fish. Aquatic Sci.* 38(6):704-710. June 1981. In English with French summ. SFA 26(3)
[Inst. Anim. Resour. Ecol., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

81-002418 Walters, Carl J. OPTIMUM ESCAPEMENTS IN THE FACE OF ALTERNATIVE RECRUITMENT HYPOTHESES. *Can. J. Fish. Aquatic Sci.* 38(6):678-689. June 1981. In English with French summ. SFA 26(3)
[Inst. Anim. Resour. Ecol., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

LAKE MANAGEMENT AND RESEARCH

81-002419 Benda, R. S. A COMPARISON OF BOTTOM TRAWL CATCH RATES IN THE KENYA WATERS OF LAKE VICTORIA. *J. Fish Biol.* 18(5):609-613. May 1981. SFA 26(3)
[Coop. Fish. Res. Unit., S. Dak. State Univ., Brookings 57007] A comparison of mean trawl catch rates (kg/h) from 128 collections in 1969 and 1970 and 63 collections in the fourth quarter of 1976 showed the following changes. (1) A reduction in mean total catch rates at all seven depth intervals from 1970-1976. (2) Reductions of 6.8, 6.1, 3.9, 6.2, 1.5, 2.9 and 5.9 times from shallow to deepest 10 m depths respectively. (3) No *Tilapia esculenta* were collected in 1976. The trend that emerges shows a marked reduction in mean total trawl catch rates in the Kenya waters of Lake Victoria which should sound a note of caution for proponents of a mechanized fishing

LAKE MANAGEMENT AND RESEARCH (CONTINUED)

81-002420 Kwain, W. and A. H. Lawrie. PINK SALMON IN THE GREAT LAKES. *Fisheries (Bull. Am. Fish. Soc.)* 6(2):2-6. Mar.-Apr. 1981. SFA 26(3)
[Lake Superior Fish. Res. Unit, 875 Queen St. East, Sault Ste-Marie, ON P6A 2B3, Canada]

81-002421 Meueller, J. W. and L. C. Rockett. LAKE DE SMET, HISTORY AND MANAGEMENT. *Wyo. Game Fish Dep. Fish. Res. Rep. Monogr. Ser.* No. 3. viii + 82p. Aug. 1980. Available from Wyo. Game Fish Dep., Cheyenne 82002. SFA 26(3)

81-002422 Rešetnikov, Ju. S. CHANGES OF THE FISH COMMUNITY OF LAKE ECOSYSTEMS IN RECENT CONDITIONS. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 113-118. 1981. SFA 26(3)
[A.N. Severcov Inst. Evol. Anim. Morphol. Ecol., USSR Acad. Sci., Moscow, USSR]

81-002423 Senft, W. H. II and B. G. Torke. A CLASSIFICATION AND MANAGEMENT PLAN FOR INDIANA LAKES. *Proc. Indiana Acad. Sci.* 89:142-143. Abstract only. 1980. SFA 26(3)
[Ball State Univ., Muncie, IN]

81-002424 Serns, S. L. and J. J. Kempinger. RELATIONSHIP OF ANGLER EXPLOITATION TO THE SIZE, AGE, AND SEX OF WALLEYES IN ESCANABA LAKE, WISCONSIN. *Trans. Am. Fish Soc.* 110(2):216-220. Mar. 1981. SFA 26(3)
[Wis. Dep. Nat. Resour., Box 440, Woodruff 54568]

81-002425 Williams, W. D. (ed.). PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON ATHALASSICA (INLAND) SALT LAKES. *Hydrobiologica* 81-82:1-444. 26 June 1981. SFA 26(3)
A collection of papers.--RS.

RIVER AND STREAM MANAGEMENT AND RESEARCH

81-002426 Bayley, P. B. FISH YIELD FROM THE AMAZON IN BRAZIL: COMPARISON WITH AFRICAN RIVER YIELDS AND MANAGEMENT POSSIBILITIES. *Trans. Am. Fish. Soc.* 110(3):351-359. May 1981. SFA 26(3)
[Dep. Oceanogr., Dalhousie Univ., Halifax, NS B3H 4J1, Canada]

81-002427 Beidler, W. M.; T. E. Nickelson and A. M. McGie. ESCAPEMENT GOALS FOR COHO SALMON IN COASTAL OREGON STREAMS. *Oreg. Dep. Fish Wildl. Inf. Rep. Ser. Fish.* no. 80-10. i + 30p. Nov. 1980. SFA 26(3)
[Oreg. Dep. Fish Wildl., Corvallis 97331] The prupose of this report is to recommend an escapement goal for coho to Oregon coastal streams based on analysis of existing data sets. Four methods were used to estimate optimum escapement: the Ricker stock-recruitment model, the relationship between spawning index counts and catch three years later, the relationship between the number of female spawners and smolt production, and calculation of the theoretical number of spawners required to produce the average catch of coastal coho from 1925-40. The four estimates were 197,000, 198,000, 190,000 and 349,000 respectively. The assumptions involved in each method are discussed. An escapement goal of 200,000 adult coho is recommended.

RIVER AND STREAM MANAGEMENT AND RESEARCH (CONTINUED)

81-002428 Binns, N. A. A HABITAT QUAILITY INDEX FOR WYOMING TROUT STREAMS. *Wyo. Game Fish Dep. Fish. Res. Rep. Monogr. Ser.* no. 2. iv + 75p. Oct. 1979. Available from Wyo. Game Fish Dep., Cheyenne 82001.

A Habitat Quality Index (HQI) was developed to predict the trout standing crop in Wyoming streams. Measurements of trout habitat were collected from 36 streams that ranged in elevation from 1,146 to 3,042 m. Average late summer stream width varied from 1.4 to 44m, while average daily flow was between 0.6 and 1.46 m^3/second. Stream gradient ranged from 0.1% to 10%. A multiple regression analysis indicated those habitat measurements best related to trout standing crop in the study streams. Predictive models were built from these measurements. The best HQI model explained 96% of the variation in trout standing crop (R=0.983), suggesting a close relationship between HQI predictions and measured trout stocks. The nine habitat attributes used in this model were late summer stream flows, annual stream flow variation, water velocity, trout cover, stream width, eroding stream banks, stream substrate, nitrate nitrogen concentration, and maximum summer stream temperature.

81-002429 Gammon, J. R. A PROPOSED STREAM CLASSIFICATION. *Proc. Indiana Acad. Sci.* 89:143. 1980. Abstract only. SFA 26(3)
[De Pauw Univ., Greencastle, IN 46135]

81-002430 Newcombe, C. A PROCEDURE TO ESTIMATE CHANGES IN FISH POPULATIONS CAUSED BY CHANGES IN STREAM DISCHARGE. *Trans. Am. Fish. Soc.* 110(3):382-390. May 1981. SFA 26(3)
[Fish Wildl. Br., Minist. Environ., Victoria, BC V8V 1X5, Canada]

LARGE IMPOUNDMENT MANAGEMENT AND RESEARCH

81-002431 Bhukaswan, T. MANAGEMENT OF ASIAN RESERVOIR FISHERIES. *FAO Fish Tech. Pap.* No. 207. ix + 69p. 1980. SFA 26(3)
[Dep. Fish., Minist. Agric. Coop., Bangkok, Thailand]

81-002432 Lusk, S. and J. Vostradovský. THE FUNCTIONAL UTILIZATION OF FISHES IN THE BIOSYSTEM OF WATER SUPPLY RESERVOIRS. *IN M. Peňáz and M. Prokeš, eds. Topical Problems of Ichthyology. Czech. Acad. Sci. Inst. Vert. Zool., Brno.* p. 83-88. 1981. SFA 26(3)
[Inst. Vert. Zool., Czech. Acad. Sci., Brno, Czechoslovakia]

81-002433 Martin, D. B.; L. J. Mengel; J. F. Novotny and C. H. Walburg. SPRING AND SUMMER WATER LEVELS IN A MISSOURI RIVER RESERVOIR: EFFECTS ON AGE-0 FISH AND ZOOPLANKTON. *Trans. Am. Fish. Soc.* 110(3):370-381. May 1981. SFA 26(3)
[U.S. FWS, Southeast. Reservoir Invest., Highway 123, Clemson, SC 29631]

ESTUARY MANAGEMENT AND RESEARCH

81-002434 Carey, R. C.; P. S. Markovits and J. B. Kirkwood. PROCEEDINGS U.S. FISH AND WILDLIFE SERVICE WORKSHOP ON COASTAL ECOSYSTEMS OF THE SOUTHEASTERN UNITED STATES. *U.S. Fish Wildl. Serv.* FWS/OBS-80/59. vii + 257p. Feb. 1981. A collection of papers.--RS. SFA 26(3)

ESTUARY MANAGEMENT AND RESEARCH (CONTINUED)

81-002435 Henley, D. E. and D. G. Rauschuber. FRESHWATER NEEDS OF FISH AND WILDLIFE RESOURCES IN THE NUECES-CORPUS CHRISTI BAY AREA, TEXAS: A LITERATURE SYNTHESIS. *U.S. Fish Wildl. Serv.* FWS/OBS-80/10. xxiv + 410p. Mar. 1981. SFA 26(3)
[North Tex. State Univ., Inst. Appl. Sci., Denton 76203]

MARINE MANAGEMENT AND RESEARCH

81-002436 FAO of the UN. STATE OF SELECTED STOCKS OF TUNA AND BILLFISH IN THE PACIFIC AND INDIAN OCEANS. *FAO Fish. Tech. Pap.* No. 200. ix + 88p. 1980. SFA 26(3)
[Rome, Italy]

81-002437 Pacific Marine Fisheries Commission. 33RD ANNUAL REPORT OF THE PACIFIC MARINE FISHERIES COMMISSION FOR THE YEAR 1980. *Pac. Mar. Fish. Comm. Annu. Rep.* 33. 43p. 1 May 1981. SFA 26(3)
[528 S.W. Mill St., Portland, OR 97201]

81-002438 Taormina, A. S. MANAGING NEW YORK'S MARINE FISHERIES. *Conservationist* 35(6):12-17. May-June 1981. SFA 26(3)

81-002439 Troadec, J.-P. and S. Garcia (eds.). THE FISH RESOURCES OF THE EASTERN CENTRAL ATLANTIC. PART ONE: THE RESOURCES OF THE GULF OF GUINEA FROM ANGOLA TO MAURITANIA. *FAO Fish Tech. Pap.* No. 186.1 vii + 166p. 1980. SFA 26(3)
[FAO of the UN, Rome, Italy]

MISC. TECHNIQUES AND EQUIPMENT

81-002440 Foster, R. W. INCREMENTAL FISH SAMPLER. *Prog. Fish.-Cult.* 43(2):99-101. Apr. 1981. SFA 26(3)
[Wash. Dep. Fish., 115 General Administration Bldg., Olympia 98504]

81-002441 McAllister, D. E. and R. J. Planck. CAPTURING FISH MEASUREMENTS AND COUNTS WITH CALIPERS AND PROBE INTERFACED WITH A COMPUTER OR POCKET CALCULATOR. *Can. J. Fish. Aquatic Sci.* 38(4):466-470. Apr. 1981. In English with French summ. SFA 26(3)
[Ichthyol. Sect., Natl. Mus. Nat. Sci., Natl. Mus. Can., Ottawa K1A 0M8, Canada]

81-002442 Sanderson, S. L. and A. C. Solonsky. A COMPARISON OF TWO VISUAL SURVEY TECHNIQUES FOR FISH POPULATIONS. *Pac. Sci.* 34(3):337. July 1980. Abstract only. SFA 26(3)
[Mar. Option Prog., Univ. Hawaii, Honolulu 96822]

81-002443 Viljanen, M. A COMPARISON OF A LARGE DIAMETER CORER AND A NEW HYDRAULIC SUCTION SAMPLER IN SAMPLING EGGS OF *COREGONUS ALBULA*. *Ann. Zool. Fenn.* 17(4):269-273. 1980. SFA 26(3)
[Sect. Ecol., Univ. Joensuu, P.O. Box 111, SF-80101 Joensuu 10, Finland]

AUTHOR INDEX

Abbad, F. N.
81-001716
Abdel'-Malek, S. A.
81-002108
Abe, H.
81-001826
Able, K. W.
81-002145
Abrahamsson, T.
81-001827
Abramov, A. A.
81-002026
Adam, H.
81-001803
Adebisi, A. A.
81-002109
Adron, J. W.
81-001754
Agrawal, N. K.
81-001828
Ainley, D. G.
81-002110
Aksenova, Ye. I.
81-002111
Alayse, J. P.
81-001994
Alderdice, D. F.
81-002246
Alevizon, W.
81-002046
Alexis, M.
81-001758
Ali, M. A.
81-001800
Allan, J. D.
81-002325
Allen, G. R.
81-002162
Alt, J. M.
81-001829
Altuf'yev, Yu. V.
81-002059
Altukhov, K. A.
81-002060
Amin, E. M.
81-002018
Amin, O. M.
81-002272
Andersen, K.
81-002243
Andersson, K.
81-002326
Aoki, M.
81-001734
Aoki, T.
81-002240
Arawomo, G. A. O.
81-002112
Arlati, G.
81-002258
Arnasson, A. N.
81-001795
Ashley, D. C.
81-002273
Austreng, E.
81-001760
81-001764
Auvinen, H.
81-002225
Avault, J. W., Jr.
81-001728
Avnimelech, Y.
81-001767
Bachmann, R. W.
81-001771
Backiel, T.
81-002391
Badino, G.
81-001736
Baer, L. J.
81-001995
Bailey, D. D.
81-002387
Baird, D.
81-002375
Balashov, N. V.
81-001830
Balazs, G. H.
81-001996
Ball, J. N.
81-001780
81-001831
Balling, S. S.
81-001769
Balon, E. K.
81-002209
Balsano, J. S.
81-001900
Bamber, R. N.
81-002058
Bamford, O. S.
81-001857
Banerji, S. R.
81-002027
Barbour, C. D.
81-002220
Barker, S. L.
81-002398
Barnby, M. A.
81-001769
Barnett, C.
81-001997
Barnthouse, L. W.
81-002403
Bartholomew, W. C.
81-002167
Bartlett, D. R.
81-002253
Barus, V.
81-002084
Bashirullah, A. K. M.
81-002274
Bates, S.
81-002341
Batten, T. F. C.
81-001780
Baugh, T. M.
81-001832

Bayley, P. B.
81-002426
Baylis, J. R.
81-002061
Beal, M. L.
81-002238
Beamish, F. W. H.
81-001948
Beamish, R. J.
81-002150
Beardsley, G. L.
81-002374
Beauchamp, J. J.
81-002340
Beeler, C. R.
81-002254
Beezhold, F. L.
81-002310
Behmer, D. J.
81-002144
Beidler, W. M.
81-002404
81-002427
Beland, K. F.
81-001968
Belyanina, T. N.
81-002163
Benda, R. S.
81-002419
Bengert, G. A.
81-002355
Bengtson, D. A.
81-001765
Beniaz, K.
81-002062
Benjamin, M.
81-002275
Bennett, M. V. L.
81-001949
Benson, P. G.
81-002229
Berglind, R.
81-002326
Bermingham, N.
81-002318
Bern, H. A.
81-001907
Bersell, P.O.
81-002106
Berst, A. H.
81-002063
Bhatt, S. D.
81-001833
Bhowmick, R. M.
81-001969
Bhukaswan, T.
81-002431
Bietz, B. F.
81-001998
81-002064
Billard, R.
81-001717
81-001847

...CONTINUED...
Billard, R.
81-002319
Bimber, D. L.
81-002199
Binns, N. A.
81-002428
Birdsong, R. S.
81-002210
Birk, Y.
81-001844
81-001845
Blackburn, J. M.
81-001839
Blackburn, M.
81-002028
Blacker, R. W.
81-002164
Blaise, C.
81-002318
Blake, B. F.
81-002151
Blake, C.
81-002151
Blake, L. M.
81-002092
Blanchet, R. H.
81-002165
Blank, T. E.
81-001769
Blaxter, J. H. S.
81-001999
Blay, J., Jr.
81-002065
Boehlert, G. W.
81-002093
Bogdanova, L. S.
81-002113
Boge, G.
81-001834
81-001835
Bohlke, J. E.
81-002208
Bondari, K.
81-001737
Bonislawsky, P. S.
81-002200
Boreman, J.
81-002047
81-002399
Borg, B.
81-001836
Borkin, I. V.
81-002166
Boros, G.
81-002269
Bowen, S. H.
81-001837
Bower, C. E.
81-001731
81-001732
Bowman, R. E.
81-002114
Bowser, P. R.
81-002256

Boyd, C. E.
81-002395
Bradley, J. S.
81-002307
Brandt, S. B.
81-002119
Bray, R. N.
81-002094
Breepoel, P. M.
81-001838
Brett, J. R.
81-001839
Brevik, E. M.
81-002298
Brill, R. W.
81-001883
Brock, R. E.
81-002095
Brody, T.
81-001970
Bromley, P. J.
81-001738
Brown, B. G.
81-001832
Brown, L.
81-002066
Brummett, A. R.
81-001840
Brusle, S.
81-001779
Bry, C.
81-001718
Bryant, P. L.
81-001739
Buccafusco, R. J.
81-002320
Buchanan, D. V.
81-002115
Buckler, D. R.
81-002321
Buckley, J.
81-001723
Bullock, A. M.
81-002276
Bullock, G. L.
81-002241
Burch, M. B.
81-002340
Burke, J. B.
81-002249
Burns, K. M.
81-002096
Burt, J. R.
81-001893
Busacker, G. P.
81-001841
Buynak, G. L.
81-001781
81-002029
81-002211
Bylund, G.
81-002277
Cacace, M.
81-001761
Cadwallader, P. L.
81-002252
Cali, A.
81-002264
Callahan, C. A.
81-002300
Cameron, A. M.
81-002322
Campbell, R. A.
81-002296
Canfield, D. E., Jr.
81-001771
Cappon, C. J.
81-002299
Carey, R. C.
81-002434
Carline, R. F.
81-002121
Carlson, B. A.
81-002212
Carlson, D. M.
81-002200
Carrato, A.
81-001824
Carvalho, F. M.
81-002116
Castillo, A. R., Jr.
81-001752
Castle, P. H. J.
81-001782
81-002194
Cech, J. J., Jr.
81-002323
Cerny, K.
81-001778
Chadwick, A.
81-001901
Chambers, J. E.
81-002327
Chapman, G. B.
81-001783
Chau, Y. K.
81-002355
Chauhan, K. S.
81-001818
81-001819
Chavin, W.
81-001841
Chaykovskaya, A. V.
81-001955
Chernyshov, V. I.
81-002278
Chess, J. R.
81-002003
Chrisman, C. L.
81-001992
Christensen, S. W.
81-002399
Chung, K. S.
81-001842
Clady, M. D.
81-001740
Clark, W. G.
81-002152

Clausen, D. M.
81-002117
Clausen, E.
81-002243
Claypool, D.
81-002201
Clements, W. H.
81-002118
Cloud, J. G.
81-001843
Coetzee, P. S.
81-002375
Cohen, T.
81-001844
81-001845
Coker, G. A.
81-002178
Colgan, P. W.
81-002067
Colle, D. E.
81-002147
Collette, B. B.
81-002213
Collins, J. C.
81-001769
Colorni, A.
81-002242
Colt, J.
81-002323
Colton, D.
81-002046
Comp, G. S.
81-002400
Conser, R. J.
81-002374
Coombs, S. H.
81-002097
Cooper, C. L.
81-002167
81-002184
Copes, P.
81-002265
Copland, J. W.
81-002255
Cornick, J.
81-002270
Cornillon, B.
81-001846
Corolla, R. T.
81-002024
Costella, A. C.
81-001770
Coulter, G. W.
81-002048
Coutant, C. C.
81-002153
Couture, P.
81-002318
Cowey, C. B.
81-001754
Cox, D. K.
81-002153
Crandall, T. A.
81-002256
Cravedi, J. P.
81-002324
Cresswell, R. C.
81-002386
Crim, L. W.
81-001847
81-002071
Crouse, M. R.
81-002300
Crowder, L. B.
81-002119
Cruz, J. M.
81-002297
Cupka, D. M.
81-002378
Curtis, M. A.
81-002279
D'Allessandris, R.
81-002332
D'Silva, A. P.
81-002383
Dabrowska, H.
81-001848
Dabrowski, K.
81-001848
Dahlberg, M. D.
81-002098
Dahlgren, B. T.
81-001741
Dalela, R. C.
81-002352
Daniels, R. E.
81-002325
Danzmann, R. G.
81-002215
Darwazeh, H. A.
81-002342
Dave, G.
81-002326
Davidenko, S. I.
81-001955
Davies, I. M.
81-002301
Davis, K. B.
81-001952
Dawe, D. L.
81-002259
de la Higuera, M.
81-001742
de Sanchez, N.
81-002257
De Silva, S. S.
81-001743
De, S.
81-002000
Deardorff, T. L.
81-002280
Demael, A.
81-001849
Denison, M. S.
81-002327
Denton, E. J.
81-001999

Dhillon, M. S.
81-002342
Dickhoff, W. W.
81-001861
Dill, P. A.
81-002221
DiMichele, L.
81-001850
Dindo, J. J.
81-001851
Dixon, D. G.
81-002328
Dizon, A. E.
81-001735
81-001866
81-001883
Dlugokenski, C.
81-002392
Dominquez, S. E.
81-002300
Donaldson, E. M.
81-002089
Doneen, B. A.
81-001852
Dorson, M.
81-002266
Douglas, W. A.
81-001784
81-001853
Dovel, W. L.
81-002168
Drake, C. M.
81-001773
Driedzic, W. R.
81-001854
81-001855
Druzhinin, A. D.
81-002030
Duggal, C. L.
81-002282
Dumont, J. N.
81-001840
Dunham, R. A.
81-001744
Dunn, J. R.
81-001798
Durbin, A. G.
81-002001
Durbin, D. V.
81-001769
Durbin, E. G.
81-002001
Dzhumaliyev, M. K.
81-001856
Eccles, D. H.
81-002068
Echelle, A. A.
81-001971
Eddy, F. B.
81-001857
Edlund, A. M.
81-002214
Edwards, A.
81-002169
Edwards, P.
81-001724
81-001745
81-001746
Edwards, R. L.
81-002291
Egami, N.
81-001988
Egidius, E.
81-002243
Egusa, S.
81-002293
Eiras, J.
81-002297
Eisenbach, G. M.
81-001829
El Tounsy, E. M.
81-001901
Elcombe, C. R.
81-002353
Eldani, A.
81-001725
Eliassen, E. E.
81-001899
Elliott, J. M.
81-001773
Ells, S. J.
81-002320
Elner, J. K.
81-002329
Elsayed, E. A.
81-001899
Elser, A. A.
81-002170
Elwood, J. W.
81-001777
Emerson, K.
81-002348
Emery, A. R.
81-002063
81-002233
Emery, L.
81-002171
Enk, M. D.
81-002073
Eurell, J. A.
81-002330
Evans, M. S.
81-002302
Everhart, W. H.
81-002358
Ezeasor, D. N.
81-001785
Ezura, Y.
81-002251
Facey, D. E.
81-002031
Fairbairn, D. J.
81-001972
Fange, R.
81-001830
81-001858
FAO of the UN
81-002359

...CONTINUED...
FAO of the UN
81-002360
81-002361
81-002376
81-002436
Farlow, J. O., Jr.
81-002120
Farrell, A. P.
81-001859
81-001860
Fee, E. J.
81-002053
Fendrick, J. L.
81-002267
Ferguson, A.
81-001973
81-001990
Ferguson, M. M.
81-002215
Fernholm, B.
81-002216
Fiandt, J. T.
81-002346
Filatova, N. A.
81-002030
Finlayson, B.
81-002315
Fisher, J. W.
81-002332
Flain, M.
81-002172
Flerova, G. I.
81-001924
Flynn, T. S.
81-001769
Folmar, L. C.
81-001861
Forster, M. E.
81-001862
Foster, R. W.
81-002440
Foyle Fisheries Commission
81-002366
Francis, M. P.
81-002154
Francis, R. I. C. C.
81-002284
Fraser, F. J.
81-002387
Fraser, G. A.
81-002364
Fraser, J. M.
81-002049
Frentzos, A. A.
81-002229
Frick, L.
81-001863
Fricke, R.
81-002217
Friedlaender, M. J.
81-002364
Frolov, O. N.
81-002405
Frost, K. J.
81-002038
81-002155
Frot-Coutaz, J.
81-001846
Fujino, K.
81-001974
Fujio, Y.
81-001864
Fukuda, Y.
81-002244
Fukui, A.
81-001933
81-001935
Fung, A. C. Y.
81-001963
81-001964
Furspan, P. B.
81-001865
Gajdusek, J.
81-001794
Galhano, M. H.
81-002297
Gammon, J. R.
81-002429
Garcia, S.
81-002439
Gardner, M. B.
81-002303
Garin, D.
81-001849
Gee, J. H.
81-002135
Geen, G. H.
81-002331
Gertler, A.
81-001844
81-001845
Ghazarian, J. G.
81-001966
Ghittino, P.
81-002258
Gibson, R. N.
81-002002
Gillen, A. L.
81-002121
Gillespie, J. H.
81-002271
Gilmore, R. G.
81-002137
Gjedrem, T.
81-001975
Godo, O. R.
81-001976
81-001977
81-002050
81-002051
81-002052
Goeden, G. B.
81-002032
Goetz, F. W.
81-001950
Goldberg, S. R.
81-002069

Goldspink, G.
81-001915
81-001916
Gooding, R. M.
81-001866
Goodyear, C. P.
81-002399
81-002410
Gooley, G. J.
81-002252
Gordin, H.
81-002242
Gorelova, T. A.
81-002122
Goren, M.
81-002173
Gorges, M. S.
81-002170
Got, R.
81-001846
Gould, W. R.
81-002174
Goven, B. A.
81-002259
Govyrin, V. A.
81-001830
Graham, J. J.
81-002159
Gratzek, J. B.
81-002259
Grave, H.
81-001747
Gray, J. A. B.
81-001999
Green, G. H.
81-002134
Greenberg, L. A.
81-002175
Griffith, R. W.
81-001867
Grigorash, V. A.
81-002142
Grizzle, J. M.
81-002281
Grofit, E.
81-002365
Grogl, M.
81-002257
Groth, P. G.
81-002377
Guhl, F.
81-002257
Gunnes, K.
81-001975
Gupta, N. K.
81-002282
81-002283
Gupta, S. D.
81-001969
Gurzynski, A. J.
81-002029
Gustafsson, J.
81-001868
Gutenmann, W. H.
81-001762
Gutmann, D. H.
81-001852
Habib, G.
81-002187
Hackney, P. A.
81-002177
Hacunda, J. S.
81-002398
Haefner, J. D.
81-002368
Haefner, J. W.
81-002407
Haegele, C. W.
81-002070
Haensly, W. E.
81-002330
Hager, R. C.
81-002253
Hager, S.
81-002392
Hall, D. J.
81-002149
Halton, D. W.
81-002287
Hamackova, J.
81-001805
Hamaguchi, A.
81-001927
Hamann, I.
81-002176
Hanson, D. F.
81-002407
Hansson, T.
81-001868
Hanyu, I.
81-002086
Hardy, G. S.
81-002218
Haresign, T. W.
81-001869
Harned, C. G.
81-002177
Hart, D. D.
81-001769
Hashimoto, K.
81-002357
Hasselrot, B.
81-002326
Hastings, P. A.
81-001870
Hata, K.
81-001871
Hatheway, M.
81-001854
81-001855
Hattingh, J.
81-001923
Hawkins, A. D.
81-002393
Hawkins, W. E.
81-002260

Hay, D. E.
81-001872
Hayasaka, S. S.
81-002245
Hayashi, K.
81-001873
Hazevoet, M.
81-001838
Heard, W. R.
81-002388
Hecht,T.
81-001726
Heckmann, R. A.
81-002205
Hecky, R. E.
81-002053
Heins, D. C.
81-002033
Henderson, P. A.
81-002058
Henderson, R. J.
81-001748
Henderson, V.
81-002332
Hendrix, S. D.
81-001735
Hengstebeck, M. F.
81-002011
Henley, D. E.
81-002435
Hennig, R.
81-002123
Herdendorf, C. E.
81-002167
81-002184
Herman, R. L.
81-002297
Herwig, H. J.
81-001799
Hesthagen, I. H.
81-002002
Hettler, W. F.
81-001733
Hibiya, T.
81-001942
81-001943
Hickey, C. R., Jr.
81-002099
Hickman, R. A.
81-001786
Hine, P. M.
81-002284
81-002285
81-002286
Hioki, S.
81-001817
81-002088
Hobson, E. S.
81-002003
Hochman, L.
81-001715
81-001719
Hodgendoorn, H.
81-001749
Hofer, R.
81-001874
Hoffman, S. G.
81-002004
Holcik, J.
81-002202
Holcombe, G. W.
81-002346
Holland, K. N.
81-002005
Hollande, E.
81-001910
Holm, E.
81-002178
Holm, T.
81-002179
Holmes, J. C.
81-002236
Holmgren, S.
81-001962
Hoogerhoud, R. J. C.
81-002219
Hooton, R. M.
81-002115
Hopwood, A. J.
81-001774
Hora, M. E.
81-002304
Horii, S.
81-002316
Horner, R. R.
81-001775
Hosokawa, H.
81-001933
Hourston, A. S.
81-002070
81-002406
Hruska, V.
81-002202
Hubbs, C. L.
81-002216
Huber, H. R.
81-002110
Huber, J. H.
81-002227
Huckins, J. N.
81-002321
Hughes, S. E.
81-002180
Hulata, G.
81-001970
Hummel, B.
81-002318
Humphreys, R. D.
81-002070
Hussain, M. A.
81-002331
Hussein, H. A.
81-002018
Huver, C. W.
81-001894
Hwang, S. J.
81-002071

Ichikawa, R.
81-002305
Idler, D. R.
81-002071
Ikeda, K.
81-001936
Ikehara, W. N.
81-001883
Imura, N.
81-002345
Ingermann, R. L.
81-001875
Innis, G. S.
81-002407
Inoue, M.
81-001734
International Council for the Exploration of the Sea
81-002367
Isuyev, A. R.
81-002278
Itazawa, Y.
81-001881
Iwama, G. K.
81-002124
Jackson, A. J.
81-001877
Jackson, D. C.
81-001954
Jackson, P. D.
81-002100
Jana, R. K.
81-001969
Jayaram, M. G.
81-001750
Jellyman, D. J.
81-002034
Jensen, A. L.
81-002381
81-002408
Jensen, J. O. T.
81-002246
Jensen, R. J.
81-002220
Jillett, J. B.
81-002107
Jobling, M.
81-001878
81-001879
John, H.-Ch.
81-002176
Johnson, D. E.
81-002308
Johnson, J. H.
81-002035
81-002125
81-002126
Johnson, L.
81-001880
Johnston, B. R.
81-002287
Johnston, D. W.
81-002306
Johnstone, A. D. F.
81-002393
Jones, G. P.
81-002072
Jonsson, A.-C.
81-001827
81-001876
Jorstad, K. E.
81-001976
81-001977
Joseph, D.
81-001751
Joshi, B. D.
81-002261
Joubert, G.
81-002318
Jude, D. J.
81-002073
81-002402
Kadota, H.
81-001928
Kajiyama, H.
81-001935
Kakimoto, D.
81-001928
Kakuda, S.
81-002074
Kalff, J.
81-001776
Kam, A. K. H.
81-001996
Kamarianos, A. P.
81-002317
Kanda, T.
81-001881
Kaneda, T.
81-001871
Kaneko, S.
81-001864
81-002316
Kappenman, R. F.
81-002409
Kapur, K.
81-001882
Kashin, S. M.
81-001883
Katayama, T.
81-001759
Kavalec, J.
81-002396
Kavaliers, M.
81-002006
81-002007
Kawamura, G.
81-001752
Kawamura, T.
81-001884
Kawano, K.
81-002240
Kaya, C. M.
81-001735
Kazakov, R. V.
81-002156

Kazantseva-Selezneva, A. A.
81-001787
Keith, R. E.
81-002235
Kelso, B. W.
81-002014
Kempinger, J. J.
81-002424
Kennedy, G. J. A.
81-002008
Kent, J. C.
81-002336
Kentouri, M.
81-001753
Kesbeke, F.
81-001958
Khan, M. A. Q.
81-002349
Kilikidis, S. D.
81-002317
Kime, D. E.
81-001885
Kimura, S.
81-002075
Kimura, T.
81-002251
Kirby, J. M.
81-002288
Kirk, B. L.
81-002403
Kirka, A.
81-001715
Kirkwood, J. B.
81-002434
Kissil, G. W.
81-001754
Kitao, T.
81-002240
Kizina, L. P.
81-002372
Kleckner, R. C.
81-001788
Kleinzeller, A.
81-001903
Kling, H. J.
81-002053
Klinger, S. A.
81-002073
Klovach, N. V.
81-001886
Knetsch, J. L.
81-002265
Knuckles, J. L.
81-002289
Kobayashi, K.
81-001817
Kohler, C. C.
81-002127
Kojis, B. L.
81-002104
Kokes, J.
81-002041
81-002128
Kolb, R. C.
81-002253
Konemann, H.
81-002333
81-002334
81-002335
Konobeyev, A. G.
81-002009
Konobeyeva, V. K.
81-002009
Konstantinov, A. S.
81-001887
Korn, S.
81-002341
Koselev, B. V.
81-002076
Koslow, J. A.
81-002129
Kotlyar, A. N.
81-002026
Kouril, J.
81-001755
81-001805
Kousouris, T.
81-002317
Kowarsky, J.
81-002101
Kowtal, G. V.
81-001969
Koz'min, A. K.
81-002036
Kozlov, V. I.
81-001978
Kramar, O.
81-002355
Kramer, D. L.
81-001888
Kreuzer, F.
81-001838
Krueger, W. H.
81-001788
Krumholz, L. A.
81-002181
Krykhtin, M. L.
81-001967
Krylova, V. D.
81-001979
Kubu, F.
81-001768
Kuehl, D. W.
81-002314
Kuhlmann, D.
81-001756
Kukuk, P. F.
81-002130
Kulkarni, C. V.
81-001789
Kumari, A.
81-002283
Kuperman, B. I.
81-002290
Kusuda, R.
81-002244

Kuz'mina, V. V.
81-001889
Kuznetsov, Ye. A.
81-002131
Kwain, W.
81-002054
81-002420
Kychanov, V. M.
81-001890
Kynard, B.
81-001723
Laale, H. W.
81-001790
81-001791
LaBar, G. W.
81-002031
81-002191
Labhsetwar, V. K.
81-001724
Lacher, M.
81-001767
Lahitette, P.
81-001920
81-001921
Lahlou, B.
81-001925
Lambert, J. G. D.
81-001956
Lamberti, G. A.
81-001769
Laming, P. E.
81-002010
Lane, H. C.
81-001891
Lanzing, W. J. R.
81-001784
81-001853
Laroche, W. A.
81-001792
Lauder, G. V.
81-002143
Lautenslager, G.
81-002268
Lawrie, A. H.
81-002420
Leatherland, J. F.
81-001892
Leaver, J.
81-001893
Lebedeva, T. V.
81-002142
LeBlanc, G. A.
81-002320
Lech, J. J.
81-002353
Lee, A.
81-002267
Leggett, W. C.
81-001986
81-002105
81-002145
Lehtinen, K.-J.
81-002337
Lehtonen, H.
81-002037
81-002055
Leknes, I. L.
81-001793
Leonard, E. N.
81-002314
Leong, J. C.
81-002267
Leong, T. S.
81-002236
Leont'eva, G. R.
81-001830
Lepot, D.
81-001849
Lessman, C. A.
81-001894
Letoublon, R.
81-001846
Leventer, H.
81-001713
Levin, S. A.
81-002410
Lewis, D. H.
81-002247
Lewis, D. S. C.
81-002068
Lewis, R. J.
81-002322
Lewis, R. M.
81-002077
Lewis, T. J.
81-002110
Liang, Y.
81-001727
Liao, D. S.
81-002378
Libby, D. A.
81-002401
Libey, G. S.
81-001992
Libosvarsky, J.
81-001794
81-002084
81-002411
Limberger, D.
81-002021
Lindquist, D. G.
81-002078
Lindsey, C. C.
81-001795
Lisk, D. J.
81-001761
81-001762
Lisovenko, L. A.
81-002079
Livingston, R. J.
81-002118
Lock, R. A. C.
81-002338
Lodi, E.
81-001736
Loeng, H.
81-002182

Loesch, J. G.
81-002080
Lone, K. P.
81-001757
Lopez-Macias, J.
81-001932
Lowry, L. F.
81-002038
81-002155
Lubbock, R.
81-002169
Ludwig, D.
81-002412
81-002417
Ludwig, R.
81-002323
Luecke, C.
81-001796
Lusk, S.
81-002362
81-002379
81-002432
Lyubayeva, O. S.
81-002390
MacGregor, R. III
81-001851
MacLellan, P.
81-002221
Madhavi, R.
81-002292
Maetz, J.
81-001919
Magnuson, J. J.
81-002119
Mahajan, C. L.
81-001828
Majkowski, J.
81-002413
Makeyeva, A. P.
81-001802
Maksimov, V. A.
81-002226
Mallatt, J.
81-001797
Maloiy, G. M. O.
81-001857
Malsberger, R. G.
81-002268
Malueg, K. W.
81-002300
Malyshev, V. I.
81-002132
Marinkelle, C. J.
81-002257
Markiw, M. E.
81-002297
Markovits, P. S.
81-002434
Markovtsev, V. G.
81-002133
Marks, P. J.
81-002307
Marliave, J. B.
81-002081
Marrin, D. L.
81-001769
Marsh, A. C.
81-002085
Marsh, B. A.
81-002085
Marshall, K. E.
81-002039
Martin, D. B.
81-002433
Martin, F. D.
81-002011
Martin, J. D.
81-002056
Martin, R. M.
81-002388
Martin, S. B.
81-002369
Mason, F. M.
81-001973
81-001990
Massingill, M.
81-001980
Mataix, F. J.
81-001742
Matarese, A. C.
81-001798
Matsuno, T.
81-001895
Matsutaka, H.
81-001895
Matsuura, T.
81-001799
Matthiessen, P.
81-002339
Mattice, J. S.
81-002340
Mattisson, A.
81-001858
Mattson, S.
81-002179
Matty, A. J.
81-001739
81-001757
Mauck, W. L.
81-002356
Mayer-Gostan, N.
81-001913
Mayer, F. L.
81-002321
McAllister, D. E.
81-002183
81-002441
McCaughran, D. A.
81-002157
McCauley, E.
81-001776
McClure, M.
81-001888
McClurg, T. P.
81-002313
McComish, T. S.
81-002040

McCormick, J. H.
81-001896
81-002384
McDonald, D. G.
81-001961
McElravy, E. P.
81-001769
McFarland, W. N.
81-002003
McGie, A. M.
81-002427
McGuire, D. L.
81-002222
McGuire, G.
81-001854
81-001855
McKeown, B. A.
81-001951
81-002331
McLean, W. E.
81-002246
McPherson, B. P.
81-002385
McReynolds, M.
81-002237
Megrey, B. A.
81-002138
Mehrle, P. M.
81-002356
Melack, J. N.
81-001727
Melius, P.
81-002350
Mellen, J. W.
81-002263
Menasveta, P.
81-001897
Mendelssohn, R.
81-002414
Menezes, N. A.
81-001800
Mengel, L. J.
81-002309
81-002433
Meyer-Rochow, V. B.
81-001801
Mezzani, G.
81-002258
Mighell, J. L.
81-001720
Mikhman, A. S.
81-002111
Mikodina, Ye. V.
81-001802
Miller, N. W.
81-001898
Mills, C. A.
81-002203
Milstein, C. B.
81-002102
Minckley, W. L.
81-002106
Misra, B. N.
81-002347
Mitchell, C. E.
81-002097
Mitchell, C. P.
81-001714
Mitchum, D. L.
81-002248
Mitsuoka, T.
81-001928
Mittelbach, G. G.
81-002149
Mittelstaedt, E.
81-002176
Miyashita, A.
81-001734
Miyazaki, C.
81-002022
Miyazaki, T.
81-002316
Mizera, J. J.
81-002184
Moalli, R.
81-001954
Moav, R.
81-001970
Modde, T.
81-002185
Modin, J. C.
81-002262
Moen, K. A.
81-001899
Mohr, H. W., Jr.
81-001781
81-002029
81-002211
Moiseeva E. B.
81-002082
Moksness, E.
81-001977
81-002389
Moles, A.
81-002341
Molnar, K.
81-002269
Monaco, P. J.
81-001900
Morgan, N.
81-002315
Mori, K.
81-001940
81-001941
Moring, J. R.
81-002115
Morishita, T.
81-001953
Moriwaki, K.
81-001988
Morley, M.
81-001901
Morrell, S. H.
81-002110
Morris, L. M.
81-002170
Morrison, C.
81-002270

Morrow, G.
81-002010
Mosier, D. T.
81-001971
Moyle, P. B.
81-001980
Mueller, J. W.
81-002421
Mulla, M. S.
81-002342
Muncy, R. J.
81-002383
Muramoto, S.
81-002343
Murata, H.
81-001902
Murchelano, R. A.
81-002291
Musch, A.
81-002335
Naftalin, R. J.
81-001903
Nakahara, M.
81-001944
Nakai, K.
81-002074
Nakamura, R.
81-001944
Nakazoe, J.
81-001946
Narasimhulu, S. V.
81-002292
Neill, W. H.
81-001866
Neilson, J. D.
81-002134
Nelson, D. O.
81-001904
Nelson, J. R.
81-001891
Nemova, N. N.
81-001905
Nesterov, V. D.
81-002226
Neumann, D. A.
81-001906
Newbold, J. D.
81-001777
Newcombe, C.
81-002430
Newsome, G. E. (Buck)
81-002221
Ney, J. J.
81-002127
Nezdolij, V. K.
81-002103
Nicholson, S. A.
81-002199
Nickelson, T. E.
81-002404
81-002427
Nicoll, C. S.
81-001907
Nikinmaa, M.
81-001908
Nilsson, S.
81-001827
81-001830
81-001876
81-001909
81-001962
Nishimura, M.
81-002022
Nishioka, R.
81-001907
Noaillac-Depeyre, J.
81-001910
Noakes, D. L. G.
81-002012
81-002215
Noeske, T. A.
81-001939
Nomura, T.
81-001941
Northcote, T. G.
81-002013
81-002014
Nosho, T.
81-001721
Novotny, J. F.
81-002433
Nowell, W. A.
81-002067
Nulton, C. P.
81-002308
Nursall, J. R.
81-002015
O'Brien, W. J.
81-001796
O'Connor, J. M.
81-001906
Ogawa, K.
81-002293
81-002357
Oguri, M.
81-001823
Ohno, S.
81-002305
Ohta, Y.
81-002022
Oiestad, V.
81-002389
Oikari, A.
81-002337
Ojima, Y.
81-001981
Okaichi, T.
81-002357
Okumura, S.
81-001974
Olenick, R. J.
81-002135
Oloffs, P. C.
81-002331
Ondrais, J. C.
81-002160

Onishi, T.
81-001911
Ooga, S.
81-001734
Outram, D. N.
81-001872
Overstreet, R. M.
81-002260
Owen, J. W.
81-002344
Pacific Marine Fisheris Commission
81-002437
Pan-Hou, H. S. K.
81-002345
Pang, P. K. T.
81-001912
81-001913
Papaconstantinou, C.
81-002186
Papaparaskeva-Papoutsoglou, E. G.
81-001758
Paperna, I.
81-002242
Papoutsoglou, S. E.
81-001758
Parker, N. C.
81-001952
Patzner, R. A.
81-001803
Paulin, C. D.
81-002187
81-002188
Pavlov, A. F.
81-001804
Pavlov, D. S.
81-002103
Payan, P.
81-001913
Pearson, D. M.
81-001807
Pekkarinen, M.
81-001914
Penaz, M.
81-001772
81-001805
81-001806
81-002041
Penney, R. K.
81-001915
81-001916
Peres, G.
81-001834
81-001835
Persson, L.
81-001917
Pervozvansky, V. Ya.
81-001982
Peter, R. E.
81-001847
Peters, D. S.
81-002136
Peters, K. M.
81-001808
Peters, P. T. W.
81-001957
Petersen, I. M.
81-001918
Peterson, M. S.
81-002137
Peterson, N.
81-002363
Pethon, P.
81-002189
Peute, J.
81-001956
Phillips, T. D.
81-002083
Phipps, G. L.
81-002346
Pic, P.
81-001919
81-001920
81-001921
81-001922
Pierce, R. J.
81-002138
Pieterse, J. J.
81-001923
Piotrovskiy, A. S.
81-002190
Pivnicka, K.
81-002198
Plakas, S. M.
81-001759
Planck, R. J.
81-002441
Plaskett, D.
81-002307
Platts, W. S.
81-002369
81-002370
Plisetskaya, E. M.
81-001924
Plosila, D. S.
81-002191
Poddubnyy, A. G.
81-002009
Polenov, A. L.
81-002059
Popek, B.
81-002062
Porthe-Nibelle, J.
81-001925
Potter, I. C.
81-002307
Potter, J. M.
81-001809
Potter, W. A.
81-001809
Price, D. G.
81-001769
Price, R.L.
81-002263
Primavera, J. H.
81-001725
Prince, E. D.
81-002309

Prokes, M.
81-002084
Prozorovskaya, M. P.
81-001830
Prut'ko, V. G.
81-002190
Puffer, H. W.
81-002238
Purcell, J. E.
81-002139
Quammen, M. L.
81-002140
Quantz, G.
81-001756
Quinn, N. J.
81-002104
Raa, J.
81-002243
Rab, P.
81-001983
81-001984
Rafter, J. J.
81-001885
Rajasilta, M.
81-002141
Ralston, S.
81-002042
81-002415
Randall, J. E.
81-002162
81-002192
81-002208
81-002223
81-002224
Rani, S.
81-002352
Rasch, E. M.
81-001900
Rath, S.
81-002347
Rauschuber, D. G.
81-002435
Raveh, A.
81-001767
Reddin, D.
81-002071
Refstie, T.
81-001760
81-001985
Reischl, E.
81-001960
Reisegg, J.
81-001976
81-001977
Reist, J. D.
81-001810
Rekubratskiy, V. A.
81-002142
Resetnikov, Ju. S.
81-002422
Resh, V. H.
81-001769
Reutter, J. M.
81-002167
Reznick, D. N.
81-002043
Ribbink, A. J.
81-002085
Rice, S. D.
81-002341
Richards, R. H.
81-001754
Richardson, S. L.
81-001798
81-001811
81-001812
81-002044
Richkus, W. A.
81-002016
Richmond, M. C.
81-001993
Riddell, B. E.
81-001986
81-002105
Rigal, A.
81-001834
81-001835
Rigley, L.
81-002023
Ringler, N. H.
81-002035
81-002126
Rinne, J. N.
81-002106
Ripatti, P. O.
81-001905
Rjabov, I. N.
81-001987
Roales, R. R.
81-001926
Roberts, F. L.
81-001968
Roberts, P. E.
81-002193
Roberts, R. J.
81-002276
Roberts, T. W.
81-002137
Rockett, L. C.
81-002421
Rodgers, L. J.
81-002249
Rodriguez-Guerrero, D.
81-001932
Rogers, W. A.
81-001931
81-002295
Roithmayr, C. M.
81-002077
Rolfe, A. E.
81-001891
Roper, D. S.
81-002107
Rosenberg, D. M.
81-001769
Ross, A. H.
81-002101

Ross, L. G.
81-002017
Ross, M. J.
81-002384
Ross, S. T.
81-002185
Rosso, S. W.
81-002344
Rottmann, R. W.
81-002147
Rout, M.
81-001969
Rubcov, V. V.
81-001820
Rudd, J. W. M.
81-002053
Rudenko, V. I.
81-002082
Rukhlov, F. N.
81-002390
Rumsey, G. L.
81-001761
81-001762
Russell, B. C.
81-002224
Russo, J. L.
81-002213
Russo, R. C.
81-002348
Sakaguchi, H.
81-001927
Sakaizumi, M.
81-001988
Sakata, T.
81-001928
Sal'nikov, N. Ye.
81-002018
Salojarvi, K.
81-002225
Sanchez-Muniz, F. J.
81-001742
Sand, O.
81-001929
Sanderson, S. L.
81-002442
Santos, G. M. dos
81-001813
Sargent, J. R.
81-001748
Sasaki, H.
81-001933
81-001934
81-001935
Sasaki, K.
81-001974
Sato, R.
81-001940
Satunovskij, M. I.
81-001930
Saul, G. E.
81-002394
Saunders, R. L.
81-001968

...CONTINUED...
Saunders, R. L.
81-001986
Savvaitova, K. A.
81-002226
Sbikin, Ju. N.
81-002019
Scarnecchia, D. L.
81-002204
Schaaf, W. E.
81-002136
Schaefer, W. F.
81-002205
Schiavone, A., Jr.
81-002206
Schiemer, F.
81-001874
Schneeberger, P. J.
81-002402
Schoenthal, N. D.
81-002314
Schoonbee, H. J.
81-001923
Schultz, D. M.
81-001769
Schwedler, T. E.
81-002281
Schweigert, J. F.
81-002406
Scott, A. L.
81-001931
81-002281
Seegers, L.
81-002227
Sekulich, P. T.
81-002057
Senft, W. H. II
81-002423
Serns, S. L.
81-002382
81-002424
Serventy, D. L.
81-002028
Shapiro, D. Y.
81-001814
Sharma, C. L.
81-001815
Shelton, W. L.
81-001932
Sheppard, D. C.
81-001737
Sherk, J. A., Jr.
81-001906
Sherman, L. E.
81-002248
Shetty, H. P. C.
81-001750
Shevchenko, N. F.
81-001816
Shevelev, M. S.
81-002166
Sheveleva, N. N.
81-002059
Shimeno, S.
81-001933

...CONTINUED...
Shimeno, S.
81-001934
81-001935
Shimizu, A.
81-002086
Shimma, H.
81-001936
Shimma, Y.
81-001936
Shireman, J. V.
81-002147
Shirvell, C. S.
81-002158
Shortreed, K. S.
81-002397
Shum, G.
81-002270
Shumway, S. E.
81-001869
Shuntov, B. P.
81-002087
Shurov, I. L.
81-002207
Shurunov, N. A.
81-002087
Shustov, Yu. A.
81-002207
Shute, J. R.
81-002078
Shute, P. W.
81-002078
Sidorov, V. S.
81-001905
Silvert, W.
81-002020
Sinchumpasak, O.-A.
81-001724
81-001745
81-001746
Singh, M. L.
81-002027
Singleton, R., Jr.
81-001850
Sinnhuber, R. O.
81-001766
Skorping, A.
81-002294
Small, G. J.
81-002228
Smart, G.
81-001738
Smayda, T. J.
81-002001
Smirnov, Yu. A.
81-002207
Smit, G. L.
81-001923
Smith, A. D. M.
81-002416
Smith, A. K.
81-002385
Smith, D. G.
81-001859

...CONTINUED...
Smith, D. G.
81-002194
Smith, J. C.
81-002299
Smith, P. J.
81-002229
Smitherman, R. O.
81-001744
Snieszko, S. F.
81-002250
Snigg, M.
81-002371
Snyder, F. L.
81-002167
Snyder, G. R.
81-001937
Soin, S. G.
81-002230
Soivio, A.
81-001908
Solangi, M. A.
81-002260
Solonsky, A. C.
81-002442
Soltitskaya, L. P.
81-001924
Sonstegard, R. A.
81-001892
Sorensen, P. G.
81-001938
Sower, S. A.
81-001722
Spangler, G. R.
81-002063
Spanovskaya, V. D.
81-002142
Speyer, M.
81-002318
Spieler, R. E.
81-001939
Sponder, D. L.
81-002143
Spotte, S.
81-001732
Sprague, J. B.
81-002328
St-Onge, D.
81-002183
Stablum, W.
81-002322
Stanek, Z.
81-001772
Stanton, R. C.
81-002313
Stark, R. W.
81-001777
Steenberg, K.
81-001764
Steffens, W.
81-001763
Steigerwald, S.
81-002175
Stein, R. A.
81-002121

Stockner, J. G.
81-001770
81-002397
Stokes, N. W.
81-002067
Stokoe, W. M.
81-001785
Stolte, H.
81-001829
Storebakken, T.
81-001764
Stout, V. F.
81-002310
Stratil, A.
81-001991
Strauss, R. E.
81-001989
Strong, C. S.
81-002110
Struhsaker, P.
81-002161
Suarez, M. F.
81-002257
Sudershan, P.
81-002349
Sufi, G. B.
81-001940
81-001941
Sugita, H.
81-001928
Sullivan, J.
81-002245
Sumari, O.
81-002277
Sundmark, G.
81-002214
Surridge, J.
81-002322
Suzuki, K.
81-001817
81-002075
81-002088
Suzuki, M.
81-001911
Suzuki, Y.
81-001942
81-001943
81-001944
Svatora, M.
81-002198
Svetlov, M. F.
81-002079
Swann, C. G.
81-002089
Swanson, R. N.
81-002271
Swenson, W. A.
81-002205
Sytina, L. A.
81-001820
81-001945
Szimonovic, I.
81-002062
Taborsky, M.
81-002021
Tabucanon, M.
81-001724
81-001746
Taggart, J.
81-001990
Tajima, K.
81-002251
Takagi, T.
81-001873
Takahashi, T.
81-001953
Takayama, S.
81-001933
81-001935
Takeda, M.
81-001933
81-001934
81-001935
Takeda, N.
81-002357
Takeuchi, M.
81-001911
81-001946
Takvorian, P. M.
81-002264
Tamaru, C. S.
81-001947
Tan, B.
81-002350
Tanaka, Y.
81-001817
81-002088
Tandler, A.
81-001948
Tandon, R. S.
81-002261
Tanno, M.
81-001871
Taormina, A. S.
81-002438
Tautz, A. F.
81-002124
Taylor, M. H.
81-001850
Tchobanoglous, G.
81-002323
Teeter, J. H.
81-001949
Terwilliger, R. C.
81-001875
Teska, J. D.
81-002144
Thakur, N. K.
81-002027
Theofan, G.
81-001950
Thomann, R. V.
81-002311
Thorman, S.
81-002214
Threlfall, W.
81-002239

Thune, R. L.
81-002295
Thurston, R. V.
81-002348
Tilley, P. A. G.
81-001951
Tokranov, A. M.
81-002195
Tomasso, J. R.
81-001952
Toor, H. S.
81-001818
81-001819
Torchy, C.
81-002266
Toresen, R.
81-002050
Torke, B. G.
81-002423
Tortonese, E.
81-002186
Townsend, D. W.
81-002159
81-002398
Treasurer, J. W.
81-002090
Trimble, A. F.
81-001777
Trjapicyna, L. N.
81-002372
Trnkova, J.
81-001772
Troadec, J.-P.
81-002439
Trunov, I. A.
81-002231
Tsai, S. C.
81-002340
Tseytlin, V. [illegible].
81-002122
Tsimenidis, [illegible] C.
81-002166
Tsingkounakis, I.
81-002317
Tsuchiya, A.
81-002022
Tulliez, J.
81-002324
Tumokhin, I. G.
81-002196
Turner, D. T.
81-001731
81-001732
Turnpenny, A. W. H.
81-002058
Tuten, J. S.
81-001728
U.S. Fish and Wildlife Service
81-002351
Uchiyama, J. H.
81-002161
Ueda, T.
81-001944
Ueno, R.
81-001953
Ueno, S.
81-002088
Ultsch, G. R.
81-001954
Usher, R. R. II
81-001765
Uskova, Ye. T.
81-001955
Utida, T.
81-001734
Valenta, M.
81-001991
Valinski, W.
81-002023
van Bohemen, C. G.
81-001956
van Eys, G. J. J. M.
81-001957
van Oijen, M. J. P.
81-002232
van Overbeeke, A. P.
81-002338
Van Vliet, K.
81-001923
van Waarde, A.
81-001958
Van Winkle, W.
81-002403
Varela, G.
81-001742
Vasil'kov, V. P.
81-002087
Vaughan, D. S.
81-002403
Veith, G. D.
81-002314
Verity, P. G.
81-002001
Verma, S. R.
81-002352
Vesin, J.-P.
81-002145
Viljanen, M.
81-002443
Vlasenko, A. D.
81-002059
Vodicnik, M. J.
81-002353
Vogele, L. E.
81-002091
Voldarsky, Z.
81-002173
Volodin, V. M.
81-001959
Volskis, R.
81-001794
Vorob'jeva, E. I.
81-001820
Vostradovsky, J.
81-002432
Wagner, H.-J.
81-001800

Walburg, C. H.
81-002433
Walker, R. L.
81-001961
Walker, T. I.
81-002312
Wallace, J. B.
81-002368
Walters, C. J.
81-002412
81-002416
81-002417
81-002418
Walvig, F.
81-001829
Wang, J.
81-001727
Wankowski, J. W. J.
81-002146
Ward, J. A.
81-002012
Watkins, C. E.
81-002147
Watling, R. J.
81-002313
Watson, T. A.
81-001951
Watts, W.
81-002017
Webb, P. W.
81-002024
Webster, J. D.
81-002237
Weerakoon, D. E. M.
81-001743
Wefring, D. R.
81-001774
Wegner, J. A.
81-001896
Weihs, D.
81-002025
Weir, J. B.
81-002197
Welch, E. B.
81-001775
Welch, K. J.
81-002314
Welcomme, R. L.
81-002391
Werme, C. E.
81-002148
Werner, E. E.
81-002149
Wertheimer, A. C.
81-002388
Wildish, D. J.
81-002306
81-002329
Wilhelm F., D.
81-001960
Wilkes, P. R. H.
81-001961
Williams, A. D.
81-002296
Williams, E. H.
81-002274
Williams, H. A.
81-002354
Williams, M.
81-002380
Williams, W. D.
81-002425
Willis, D. W.
81-001729
Wilson, D.
81-002315
Wilson, J.
81-002373
Wilson, S. W.
81-001907
Winberg, M.
81-001962
Winterbottom, R.
81-002233
Wisnes, A. R.
81-001899
Wissing, T. E.
81-002138
Witt, A., Jr.
81-002321
Witt, U.
81-001756
Witte-Maas, E. L. M.
81-002232
81-002234
Witte, F.
81-002045
81-002219
81-002232
81-002234
Wlodek, J.
81-001794
Wohlfarth, G.
81-001970
Wohlgemuth, E.
81-001772
81-001805
Wolf, K.
81-002297
Wolters, W. R.
81-001992
Wong, P. T. S.
81-002355
Woo, N. Y. S.
81-001963
81-001964
Wood, C. M.
81-001961
Wood, J. R.
81-001769
Wood, M. J.
81-002387
Woodward, D. F.
81-002356
Wootten, R.
81-002354
Wyban, J.
81-001965

Yamaguchi, K.
81-002357
Yamano, T.
81-001981
Yamashita, S.
81-001884
Yanagishi, T.
81-002316
Yanda, D. M.
81-001966
Yano, I.
81-001821
Yarbrough, J. D.
81-002327
Yatomi, H.
81-001734
Yevsin, V. N.
81-001822
Yoshikawa, H.
81-001823
Yoshimizu, M.
81-002251
Young, A. H.
81-002017
Youngman, S.
81-002267
Youngs, W. D.
81-002358
Yu, T. C.
81-001766
Zalewski, B. R.
81-002197
Zall, R. R.
81-001761
Zander, C. D.
81-002123
Zapata, A.
81-001824
Zelinsky, Yu. P.
81-001982
Zhirnova, A. A.
81-001967
Zimmerman, E. G.
81-001993
Zolotnitskiy, A. P.
81-001825
Zur, O.
81-001730
81-001767
Zwicker, B.
81-002270

Africa
81-002360
Africa: Lake Malawi
81-002068
81-002085
Africa: Lake Tanganyika
81-002048
81-002053
Africa: Lake Victoria
81-002045
81-002232
Alaska
81-002117
81-002155
81-002180
Amazon River
81-001813
81-002426
Arizona
81-002106
Arkansas: Bull Shoals Reservoir
81-002091
Asia
81-002431
Atlantic Ocean
81-001974
81-002439
Atlantic Ocean, North
81-001972
81-001976
81-002037
81-002050
81-002051
81-002052
81-002097
81-002099
81-002114
81-002120
81-002123
81-002132
81-002136
81-002145
81-002164
81-002179
81-002182
81-002189
81-002216
81-002287
81-002296
81-002374
Atlantic Ocean, South
81-002231
Australia
81-002028
81-002312
Australia: Aberfeldy River
81-002100
Australia: Fitzroy River
81-002101
Australia: Queensland
81-002380
Australia: Queensland: Serpentine Creek
81-002104
Australia: Swan-Avon Estuary
81-002307
Barents Sea
81-002182
Bering Sea
81-001972
81-002038
81-002180
Botswana
81-002339
Brazil
81-002169
Brazil: Amazon River
81-002426
Brazil: Amazonia
81-001813
California
81-002003
81-002016
81-002094
81-002140
81-002256
California: San Luis Reservoir
81-001980
Canada: Alberta: Cold Lake
81-002236
Canada: Alberta: Redwater River
81-001810
Canada: British Columbia
81-001770
81-002070
81-002364
81-002397
81-002406
Canada: New Brunswick
81-001986
81-002105
81-002306
Canada: New Brunswick: Nashwaak Exp. Watershed
81-002056
Canada: Newfoundland
81-002239
Canada: Northwest Territories
81-002279
Canada: Northwest Territories: Coppermine River
81-002183
Canada: Nova Scotia: Stewiacke River
81-001968
Canada: Ontario
81-002049
81-002197
Carribean Sea
81-002163
China
81-001727
Colombia
81-002257
Cuba
81-002084
Czechoslovakia
81-001715

...CONTINUED...
Czechoslovakia
81-001719
81-001772
81-002041
81-002362
81-002379
81-002432
Czechoslovakia: Bela River
81-002128
Czechoslovakia: Danube River
81-002202
Egypt: Lake Burullus
81-002018
Egypt: Lake Qarun
81-002108
England: Fawley Power Stn.
81-002058
Finland
81-002037
81-002055
Florida
81-002096
Florida: Apalachee Bay
81-002118
Florida: Apalachicola Bay
81-002165
Florida: Indian River Lagoon
81-002137
Florida: Tampa Bay
81-002083
Florida: Tampa Bay: Big Bend Power Stn.
81-002400
Great Lakes
81-001892
81-002171
81-002314
81-002420
Greece
81-002160
Greece: Crete
81-002317
Greece: Thermaikos Gulf
81-002186
Gulf of Aden
81-002030
Gulf of Mexico
81-002163
81-002185
81-002280
81-002308
81-002374
Hawaii
81-002042
81-002192
81-002194
81-002415
Hawaii: Honokohau
81-002095
Idaho
81-002057
Illinois
81-002263
India
81-002027

...CONTINUED...
India
81-002282
81-002283
Indian Ocean
81-001974
81-002190
81-002196
81-002208
81-002217
81-002223
81-002231
81-002233
81-002292
81-002436
Indiana
81-002237
81-002423
Japan
81-002075
81-002316
Kentucky
81-002175
Kenya: Lake Victoria
81-002419
Lake Erie
81-002167
81-002184
Lake Malawi
81-002068
81-002085
Lake Michigan
81-002040
81-002073
81-002119
81-002351
Lake Superior
81-002054
81-002205
Lake Tanganyika
81-002021
81-002048
81-002053
Lake Victoria
81-002045
81-002232
81-002419
Louisiana
81-002033
Maine: Damariscotta Lake
81-002401
Maine: Sheepscot River Estuary
81-002159
Martinique
81-002227
Massachusetts
81-002148
Mediterranean Sea
81-001816
Mexico
81-001900
81-002151
Montana
81-002174

...CONTINUED...

Montana
81-002201
81-002222
81-002314
81-002363
Montana, Southeastern
81-002170
Natural History
Foods/Feeding
81-002108
Nebraska: Atkinson Reservoir
81-002273
Nevada: Nye Cty.: Railroad Valley
81-001832
New Jersey
81-002102
New York
81-002099
81-002438
New York: Cayuga Lake
81-002047
81-002098
New York: Chautauqua Lake
81-002199
New York: Hudson River
81-002403
New York: Hudson River Estuary
81-002168
New York: Lake Champlain
81-002191
New York: Lawrence Cty.: Black Lake
81-002206
New York: Salmon River
81-002035
81-002125
New York: St. Lawrence River
81-002092
New Zealand
81-001714
81-002087
81-002154
81-002187
81-002188
81-002193
81-002284
81-002285
81-002286
New Zealand: Lake Pounui
81-002034
New Zealand: Otago Coast
81-002107
New Zealand: South Coast
81-002172
New Zealand: Wellington Harbor
81-002229
Nigeria
81-002109
North Carolina
81-002078
North Sea
81-002123
81-002132
81-002164
Northern Ireland
81-001990
81-002366
Norway
81-002050
81-002051
81-002052
81-002189
81-002243
Norway: Lake Mjosa
81-002298
Ohio River
81-002181
Ohio: Acton Lake
81-002138
Ohio: Maumee River Estuary
81-002167
Ohio: Sandusky River Estuary
81-002167
Ontario
81-002178
81-002215
Oregon
81-002044
81-002204
81-002404
81-002427
Oregon: Rogue River
81-002385
Oregon: Willamette River
81-002115
Pacific Ocean
81-001812
81-001972
81-001974
81-002003
81-002026
81-002028
81-002042
81-002044
81-002087
81-002093
81-002094
81-002117
81-002129
81-002172
81-002193
81-002194
81-002208
81-002212
81-002213
81-002223
81-002224
81-002310
81-002415
81-002436
81-002437
Pacific Ocean, North
81-002038
Pacific Ocean: Gulf of Alaska
81-002180
Pennsylvania
81-002288

Pennsylvania: Susquehanna River
81-002029
81-002211
Pensylvania
81-001781
Puerto Rico
81-002274
Red Sea
81-002162
81-002173
Scotland
81-002301
Scotland: Loch Leven
81-002112
South Africa
81-002375
South Carolina
81-002378
South Carolina: Keowee Reservoir
81-002309
South Dakota: Lake Francis Case
81-002433
Sweden
81-002179
Tennessee: Cumberland River
81-002177
Texas
81-001971
81-002033
Texas: Corpus Christi Bay
81-002435
Thailand: Gulf of Thailand
81-001897
United Kingdom
81-002097
USSR
81-001978
81-002059
81-002390
USSR: Kamchatka
81-002195
USSR: Lake Khanka
81-002133
USSR: Lake Lacha
81-002036
USSR: Mozhaysk Reservoir
81-002142
USSR: Palon'ga River
81-001822
USSR: Severnaya Sos'va River
81-001804
USSR: Taymyr Peninsula
81-002226
USSR: Volga River
81-002372
USSR: White Sea
81-002060
Vermont: Lake Champlain
81-002031
Virginia: Claytor Lake
81-002127
Washington
81-002044
Washington: Ozette River
81-002392
Wisconsin
81-002272
Wisconsin: Escanaba Bay
81-002424
Wisconsin: Vilas Cty.: Wolf Lake
81-002382
Wyoming: Green River
81-002371
Wyoming: Johnson Cty: Lake De Sme
81-002421
Zambia
81-002396

Abramis ballerus
Reproductive System
81-001959
Temperature
81-001959
Abramis brama
Blood Chemistry
81-001924
Enzymes
81-001889
Hybridization
81-001982
Karyotypes
81-001982
Meristic Studies
81-001794
Acanthuridae
Aggressive Behavior
81-001995
Communication
81-001995
Acheilognathus tabira
Reproduction
81-002086
Spawning
81-002086
Acipenser brevirostrum
Culture/Propagation
81-001723
Acipenser fulvescens
Distribution/Geographical
81-002177
Acipenser guldenstadti
Flow Regimes
81-002059
Free Radical Pathology
81-002278
Parasites/Diseases
81-002278
Reservoir Release Effects
81-002059
Spawning
81-002059
Acipenser ruthenus
Hybridization
81-001979
Acipenser stellatus
Free Radical Pathology
81-002278
Parasites/Diseases
81-002278
Acipenseridae
Embryology
81-001945
Temperature
81-001945
Actinopterygii
Operculum
81-001787
Respiratory System
81-001787
Algansea
Taxonomy
81-002220
Alosa
Abundance/Factors of
81-002102
Distribution/Seasonal
81-002102
Alosa aestivalis
Distribution/Geographical
81-002191
Fecundity
81-002080
Identification
81-002221
Organ Weights
81-002080
Reproductive System
81-002080
Alosa pseudoharengus
Fish Kills
81-002127
Fish Passage
81-002401
Fishways
81-002401
Identification
81-002221
Predator/Prey Relationships
81-002127
Sex Ratios
81-002401
Amphipnous cuchia
Life History/General
81-002027
Spawning
81-002027
Anchoa mitchilli
Spawning
81-002083
Anguilla anguilla
Blood Chemistry
81-001838
Dermocystidium anguillae
81-002258
Gill Parasites
81-002258
Myxidium giardi
81-002255
Parasites/Diseases
81-002255
81-002258
Pineal Body
81-001799
Protozoan Diseases
81-002255
81-002258
Temperature
81-002018
Wind
81-002018
Anguilla australis schmidtii
Hypoxia
81-001862
Respiration
81-001862

Anguilla rostrata
Aeromonas salmonicida
81-002245
Bacterial Diseases
81-002245
Buoyancy Adjustment
81-001786
Furunculosis
81-002245
Life History/General
81-002031
Parasites/Diseases
81-002245
Swimbladder
81-001786
81-001788
Anthias squamipinnis
Coloration
81-001814
Sex Reversal
81-001814
Antimora
Taxonomy
81-002228
Argyropelecus hemigymnus
Distribution/Geographical
81-002189
Argyropelecus olfersi
Distribution/Geographical
81-002189
Atherina mochon pontica
Metabolic Rates
81-001886
Atherina presbyter
Life History/General
81-002058
Population Studies
81-002058
Atlantic Ocean, North
81-002301
Barbus bariloides
Karyotypes
81-001983
Barbus holotaenia
Karyotypes
81-001983
Bathygobius soporator
Early Development
81-001808
Embryology
81-001808
Batrachoides
Taxonomy
81-002213
Benthosema glaciale
Distribution/Geographical
81-002166
Boreogadus saida
Life History/General
81-002038
Botia horae
Sound Production
81-002023
Brachydanio rerio
Cadmium
81-002326
Embryology
81-001790
81-001791
Growth Depressents
81-001926
Lipid Content
81-001926
Solvent Extraction
81-002326
Bramidae
Distribution/Geographical
81-002188
Bregmaceros
Distribution/Geographical
81-002163
Brevoortia patronus
Maturation
81-002077
Spawning
81-002077
Brevoortia tyrannus
Bioenergetics
81-002136
Culture/Propagation
81-001733
Foods/Feeding
81-002136
Metabolic Rates
81-002001
Population Studies
81-002136
Swimming Performance
81-002001
Carangidae
Culture/Propagation
81-001734
Carassius auratus
ATP
81-001841
81-001915
81-001916
Carotenoids
81-001895
Enzymes
81-001916
81-001958
Hormones
81-001939
Karyotypes
81-001981
Lipid Composition
81-001852
Lipid Metabolism
81-001852
Osmoregulation
81-001841
Temperature
81-001915
81-001916
Carassius auratus gibelio
Age/Growth
81-002041

...CONTINUED...
Carassius auratus gibelio
Foods/Feeding
81-002041
Spawning
81-002041
Catla catla
Culture/Propagation
81-001969
Hybridization
81-001969
Catostomidae
Fish Lists/Keys
81-002222
Identification/Larvae
81-002211
81-002222
Catostomus commersoni
Osmoregulation
81-001961
Reproduction
81-001894
Centropomus nigrescens
Age/Growth
81-002151
Chaetodon miliaris
Fecundity
81-002042
Foods/Feeding
81-002042
Spawning
81-002042
Channa punctatus
Ascorbic Acid
81-001828
Iodine
81-001828
Chanos chanos
Age/Growth
81-002151
Culture/Propagation
81-001725
Foods/Feeding
81-001752
Polyculture
81-001725
Pond Culture
81-001725
Chela bacala
Hamacreadium manteri
81-002283
Parasites/Diseases
81-002283
Trematodes
81-002283
Chela gora
Hamacreadium manteri
81-002283
Parasites/Diseases
81-002283
Trematodes
81-002283
Chlamydoselachus anguineus
Distribution/Geographical
81-002196
Chromis punctipinnis
Foods/Feeding
81-002094
Movements
81-002094
Chrysophrys auratus
Heavy Metals
81-002312
Mercury
81-002312
Chrysophrys major
Blood Chemistry
81-001927
Osmoregulation
81-001963
Salinity
81-001963
Starvation
81-001927
81-001964
Temperature
81-001927
81-001964
Toxic Algae
81-002357
Cichlasoma citrinellum
Communication
81-001997
Cichlasoma meeki
Cardio-Vascular System
81-001793
Cichlidae
Brooding Behavior
81-002021
Ecology
81-002232
Habitat Selection
81-002045
Management/Research--Lakes
81-002045
Parasites/Diseases
81-002268
Rhabdovirus
81-002268
Spawning
81-002045
Taxonomy
81-002232
Viral Diseases
81-002268
Cirrhilabrus temminckii
Early Development
81-001817
Embryology
81-001817
Spawning
81-001817
Cirrhina mrigala
Nervous System
81-001815
Cirripectes auritus
New Species
81-002212

Clarias batrachus
Endocrinology
81-001833
Hormones
81-001833
Clarias gariepinus
Culture/Propagation
81-001726
Feeding Experiments
81-001726
Fingerling Production
81-001726
Clarias lazera
Culture/Propagation
81-001749
Feeding Experiments
81-001749
Fingerling Production
81-001749
Clinocottus analis
Habitat Selection
81-002016
Clupea harengus
Age/Growth
81-002159
Startle Response
81-001999
Swimbladder
81-001999
Clupea harengus harengus
Dredge Spoils
81-002306
Impingement/Entrainment
81-002398
Power Plants
81-002398
Thermal Shock
81-002398
Clupea harengus pallasi
Maturation
81-001872
Population Studies
81-002406
Spawning
81-002070
Cobitis taenia bilineata
Culture/Propagation
81-001736
Contusus brevicaudus
New Species
81-002218
Contusus richei
Taxonomy
81-002218
Coregonidae
Culture/Propagation
81-001719
Life History/General
81-002037
Polyculture
81-001719
Population Studies
81-002037
Coregonus albula
Egg Samplers
81-002443
Coregonus clupeaformis
Foods/Feeding/Selectivity
81-002144
Coregonus lavaretus
Foods/Feeding
81-002113
Meristic Studies
81-002225
Taxonomy
81-002225
Coregonus tugun
Morphology
81-001804
Corydoras aeneus
Air Breathing
81-001888
Cardio-Vascular System
81-001793
Cottidae
Distribution/Geographical
81-002195
Early Development
81-001812
Variation Studies
81-001989
Cottus bairdi
Spawning
81-002066
Couesius plumbeus
Circadian Rhythms
81-002006
Distribution/Geographical
81-002197
Light
81-002006
Crenichthys nevadae
Temperature
81-001832
Ctenopharyngodon idella
Aquatic Plant Control
81-001714
Culture/Propagation
81-001743
Digestion Rates
81-001743
Feeding Experiments
81-001743
Foods/Feeding
81-002147
Predator/Prey Relationships
81-002131
Culaea inconstans
Variation Studies
81-001810
Cyclothone
Foods/Feeding
81-002122
Cyclothone alba
Distribution/Geographical
81-002189

Cynoscion xanthulus
Age/Growth
81-002151
Cyprinidae
Genetics
81-001991
Hybridization
81-001987
Cyprinnus carpio
Enzymes
81-001934
Excretory System
81-001934
Cyprinodon dearborni
Temperature
81-001842
Cyprinodon variegatus
Culture/Propagation
81-001765
Feeds
81-001765
Larval Rearing
81-001765
Cyprinus carpio
Abnormalites
81-001819
Abnormalities
81-001818
Amino Acids
81-001759
Cadmium
81-002343
Complexing Agents
81-002343
Culture/Propagation
81-001739
81-001755
81-001757
81-001970
Diets
81-001739
Digestive System
81-001759
81-001818
DTPA
81-002343
EDTA
81-002343
Embryology
81-001947
Enzymes
81-001844
81-001845
81-001911
81-001935
81-001953
Feeding Experiments
81-001739
81-001755
Feeds
81-001739
Fins
81-001819

...CONTINUED...
Cyprinus carpio
Growth Stimulants
81-001757
Heated Water
81-001755
Inflamatory Response
81-001942
81-001943
Injuries
81-001942
81-001943
Lactate Dehydrogenase
81-001947
Lipid Content
81-001946
Lipid Metabolism
81-001871
Metabolism
81-001902
Mucophilosis
81-002269
Nutrition
81-001759
81-001763
81-001911
81-001946
Parasites/Diseases
81-001942
81-001943
81-002269
81-002291
Phosphorus
81-001911
81-001946
Polychlorinated Biphenyls
81-002304
Pond Culture
81-001755
Power Plant Effluents
81-002340
Predator/Prey Relationships
81-002131
Selective Breeding
81-001970
Trihalomethanes
81-002340
Tumors
81-002291
Dalatias licha
Lipid Composition
81-001873
Diplogrammus pygmaeus
New Species
81-002217
Dorosoma cepedianum
Foods/Feeding
81-002138
Dorosoma petenense
Distribution/Vertical
81-002106
Dysomminae
Distribution/Geographical
81-002194

Elops affinis
Age/Growth
81-002151
Embassichthys bathybius
Early Development
81-001811
Eggs
81-001811
Taxonomy
81-001811
Embiotoca lateralis
Blood Chemistry
81-001875
Enchelyopus cinibrius
Foods/Feeding
81-002114
Engraulis encrasicholus
Variation Studies
81-001816
Engraulis mordax
Foods/Feeding/Selectivity
81-002129
Life History/General
81-002044
Population Studies
81-002044
Swimming Performance
81-002024
Epinephelus
Ammonia
81-002317
Copper
81-002317
Eptatetus
Taxonomy
81-002216
Eptatetus minor
New Species
81-002216
Eptatetus multidens
New Species
81-002216
Esox lucius
Life History/General
81-002036
Management/Research--Lakes
81-002036
Esox masquinongy
Abundance/Factors of
81-002199
Management/Research--Lakes
81-002199
Population Studies
81-002199
Esox masquinongy x Esox lucius
Culture/Propagation
81-002121
Foods/Feeding
81-002121
Stocking Introductions
81-002121
Etheostoma exile
Distribution/Geographical
81-002197
Etheostoma nigrum
Distribution/Geographical
81-002197
Etheostoma perlongum
Spawning
81-002078
Etheostoma sagitta
Distribution/Geographical
81-002175
Euthynnus affinis
Culture/Propagation
81-001735
Induced Maturation
81-001735
Fundulus
Eimeria funduli
81-002260
Parasites/Diseases
81-002260
Protozoan Diseases
81-002260
Fundulus heteroclitus
Endocrinology
81-001912
Fertilization
81-001840
Hatching Enzyme
81-001850
Hormones
81-001912
Immune Response
81-001898
Fundulus kansae
Abundance/Factors of
81-002201
Distribution/Factors of
81-002201
Fundulus parvipinnis
Parasites/Diseases
81-002238
Gadidae
Age/Growth
81-002155
Bucephaloides gracilescens
81-002287
Otoliths
81-002155
Parasites/Diseases
81-002287
Predator/Prey Relationships
81-002155
Trematodes
81-002287
Trophic Relationships
81-002155
Gadus macrocephalus
Age/Growth
81-002150
Early Development
81-001798
Foods/Feeding
81-002117
Gadus morhua
Age/Length Composition
81-002052

...CONTINUED...
Gadus morhua
Catecholamines
81-001876
Chromaffin Tissue
81-001876
Enzymes
81-001876
81-001893
81-001962
Foods/Feeding
81-002114
Hybridization
81-001977
Nervous System
81-001962
Population Studies
81-002051
Stocking/Introductions
81-002389
Survival
81-002389
Variation Studies
81-001976
Gambusia affinis
DDT
81-002327
Glugea
81-002256
Insecticides
81-002327
Organochlorines
81-002327
Parasites/Diseases
81-002256
Protozoan Diseases
81-002256
Gasterosteus aculeatus
Foods/Feeding
81-002141
Hormones
81-001836
Reproduction
81-001836
Gerreidae
Foods/Feeding
81-002137
Ginglymostoma cirratum
Lymphomyeloid System
81-001858
Gobius batrachocephalus
Spawning
81-002082
Gorgasia preclara
New Species
81-002208
Halichoeres chrysus
New Species
81-002223
Halichoeres melasmapomus
New Species
81-002223
Haplochromis
Ecology
81-002232

...CONTINUED...
Haplochromis
Habitat Selection
81-002045
Management/Research--Lakes
81-002045
Spawning
81-002045
Taxonomy
81-002219
81-002232
Haplochromis chrysonotus
Spawning
81-002068
Haplochromis cnester
Cleaning Behavior
81-002234
New Species
81-002234
Haplochromis teunisrasi
Cleaning Behavior
81-002234
New Species
81-002234
Haplomacrourus nudirostris
New Species
81-002231
Hemanthias vivanus
Hermaphoditism
81-001870
Hemiculter eigenmanni
Foods/Feeding
81-002133
Heteroconger cobra
New Species
81-002208
Heteroconger lentiginosus
New Species
81-002208
Heteroconger perissodon
New Species
81-002208
Heterocope
Coloration
81-001796
Hiodon alosoides
Distribution/Geographical
81-002197
Hiodon tergisus
Distribution/Geographical
81-002197
Hippoglossoides platessoides
Foods/Feeding
81-002114
Hippoglossus stenolepis
Age/Growth
81-002157
Huso huso
Adrenergic System
81-001830
Chromaffin Tissue
81-001830
Flow Regimes
81-002059

...CONTINUED...
Huso huso
Free Radical Pathology
81-002278
Hybridization
81-001979
Parasites/Diseases
81-002278
Reservoir Release Effects
81-002059
Spawning
81-002059
Hybopsis meeki
Distribution/Geographical
81-002174
Hypodytes rubripinnis
Life History/General
81-002088
Spawning
81-002088
Hypophthalmichthys molitrix
Blood Chemistry
81-001923
Predator/Prey Relationships
81-002131
Hypophthalmus edentatus
Foods/Feeding
81-002116
Ictalurus catus
Culture/Propagation
81-001744
Feeding Experiments
81-001744
Ictalurus furcatus
Culture/Propagation
81-001744
Feeding Experiments
81-001744
Ictalurus melas
Papillomas
81-002281
Parasites/Diseases
81-002281
Ictalurus nebulosus
Bioenergetics
81-001865
Osmoregulation
81-001865
Ictalurus punctatus
Bioenergetics
81-001865
Blood Chemistry
81-001931
Cage Culture
81-001740
Corticosteroids
81-001952
Culture/Propagation
81-001737
81-001740
81-001744
Feeding Experiments
81-001737
81-001740

...CONTINUED...
Feeding Experiments
81-001744
Feeds
81-001737
Hypoxia
81-001931
Ichthophthiriasis
81-002259
Ichthyophthirius multifiliis
81-002259
Immunization
81-002259
Invertebrate Forage
81-001737
Nitrite
81-002323
Olfaction
81-002005
Osmoregulation
81-001865
Parasites/Diseases
81-002259
Polyculture
81-001740
Postassium Dichromate
81-002336
Protozoan Diseases
81-002259
Stress
81-001952
Triploid Fish
81-001992
Istiophoridae
Harvest
81-002374
Management/Research--Marine
81-002374
81-002436
Population Studies
81-002436
Isurus oxyrhinchus
Heavy Metals
81-002313
Mercury
81-002313
Katsuwonus pelamis
Age/Growth
81-002161
Distribution/Geographical
81-002028
Enzymes
81-001826
Life History/General
81-002028
Locomotion
81-001883
Metabolic Rates
81-001866
Nervous System
81-001883
Oxygen
81-001866
Variation Studies
81-001974

Kryptopterus
Acoustico-Lateralis System
81-001949
Labeo rohita
Maturation
81-001882
Labroides dimidiatus
Early Development
81-001817
Embryology
81-001817
Spawning
81-001817
Lampanyctus macdonaldi
Distribution/Geographical
81-002189
Lampetra fluviatilis
Reproductive System
81-001885
Steroids
81-001885
Latridopsis ciliaris
Age/Growth
81-002154
Lavinia exilicauda
Hybridization
81-001980
Leiostomus xanthurus
Metabolic Rates
81-001906
Lepidocybium flavobrunneum
Distribution/Geographical
81-002187
Lepisosteus platyrhincus
Adrenergic System
81-001909
Chromaffin Tissue
81-001909
Enzymes
81-001827
Lepomis cyanellus
Acanthocephala
81-002273
Nervous System
81-001904
Parasites/Diseases
81-002273
Temperature
81-001904
Lepomis gibbosus
Acanthocephala
81-002273
Argulus maculosus
81-002289
Parasites/Diseases
81-002273
81-002289
Parasitic Copepods
81-002289
Spawning
81-002067
Lepomis humilis
Distribution/Geographical
81-002178
Lepomis macrochirus
Acanthocephala
81-002273
Cleidodiscus robustus
81-002295
Dieldrin
81-002349
Foods/Feeding
81-002149
81-002303
Habitat Selection
81-002149
Insecticides
81-002349
Parasites/Diseases
81-002273
81-002295
Pentachlorophenol
81-002344
Toxicology
81-002320
Trematodes
81-002295
Turbidity
81-002303
Lepomis megalotis peltastes
Spawning
81-002064
Territorial Behavior
81-001998
Leuciscus cephalus
Early Development
81-001778
Embryology
81-001778
Hybridization
81-001978
Leuciscus leuciscus
Abundance/Factors of
81-002203
Egg Survival
81-002203
Population Studies
81-002203
Limanda ferruginea
Foods/Feeding
81-002114
Liopsetta putnami
Early Development
81-001792
Thermal Shock
81-002398
Liposetta putnami
Impintement/Entrainment
81-002398
Power Plants
81-002398
Liza aurata
Reproductive System
81-001779
Lophius budegassa
Age/Growth
81-002160

Lophius piscatorius
Age/Growth
81-002160
Lutjanidae
Distribution/Geographical
81-002030
Life History/General
81-002030
Maccullochella peeli
Fungal Diseases
81-002252
Parasites/Diseases
81-002252
Saprolegnia
81-002252
Macrozoarces americanus
Exercise
81-001855
Metabolic Rates
81-001854
Mallotus villosus
Distribution/Factors of
81-002182
Distribution/Geographical
81-002197
Foods/Feeding
81-002145
Temperature
81-002182
Mastacembelus armatus
Nematodes
81-002282
Parasites/Diseaeses
81-002282
Zeylanema jullundurense
81-002282
Melanogrammus aeglefinus
Foods/Feeding
81-002114
Menidia
Unisex Populations
81-001971
Merluccius bilinearis
Foods/Feeding
81-002114
Microgadus proximus
Early Development
81-001798
Microgobius
Taxonomy
81-002210
Microgobius gulosus
Early Development
81-001808
Embryology
81-001808
Micromesistius poutassou
Distribution/Geographical
81-002164
Micropogon ectenes
Age/Growth
81-002151
Micropogon undulatus
Oil
81-002330
Micropterus dolomieui
Movements
81-002092
Spawning
81-002091
Micropterus salmoides
Acanthocephala
81-002273
Culture/Propagation
81-001729
Distribution/Vertical
81-002106
Fry Production
81-001729
Gill Parasites
81-002263
Marking/Tagging
81-002384
Metabolic Rates
81-001948
Movements
81-002092
Myxobolus microcystus
81-002263
Parasites/Diseases
81-002263
81-002273
Protozoan Diseases
81-002263
Spawning
81-002084
Specific Dynamic Action
81-001948
Telemetry
81-002384
Temperature
81-001896
Monacanthus ciliatus
Foods/Feeding
81-002118
Monacanthus hispidus
Foods/Feeding
81-002118
Morone americana
Impingement/Entrainment
81-002403
Metabolic Rates
81-001906
Populations Studies
81-002403
Power Plants
81-002403
Morone chrysops
Distribution/Geographical
81-002174
Morone mississippiensis
Parasites/Diseases
81-002237
Morone saxatilis
Age/Growth
81-002153

...CONTINUED...
Morone saxatilis
Currents
81-002099
Metabolic Rates
81-001906
Movements
81-002099
Temperature
81-002153
Mugil auratus
Integument
81-001955
Mugil capito
Osmoregulation
81-001919
81-001920
81-001921
81-001922
Mugil cephalus
Bacterial Diseases
81-002249
Lipid Composition
81-001851
Parasites/Diseases
81-002249
Red-Spot Disease
81-002249
Steroids
81-001851
Vibrio anguillarum
81-002249
Mylio macrocephalus
Toxic Algae
81-002357
Myoxocephalus quadricornis
Distribution/Geographical
81-002197
Myxine glutinosa
Liver
81-001803
Organ Weights
81-001803
Osmoregulation
81-001829
Neenchelys
Early Development
81-001782
Nibea albiflora
Maturation
81-002074
Spawning
81-002074
Nocomis biguttatus
Taxonomy
81-002215
Nocomis micropogon
Taxonomy
81-002215
Notolepis rissoi
Distribution/Geographical
81-002189
Notopterus notopterus
Phenols
81-002352
Notropis atherinoides
Distribution/Geographical
81-002197
Notropis buchanani
Distribution/Geographical
81-002178
Notropis cornutus
Distribution/Geographical
81-002197
Early Development
81-001781
Notropis heterolepis
Distribution/Geographical
81-002197
Notropis hudsonius
Distribution/Geographical
81-002197
Power Plant Effluents
81-002309
Thermal Pollution
81-002309
Notropis lutrensis
Temperature
81-001993
Variation Studies
81-001993
Notropis sabinae
Life/History/General
81-002033
Notropis spilopterus
Gyrodactylus atratuli
81-002288
Parasites/Diseases
81-002288
Trematodes
81-002288
Notropis volucellus
Early Development
81-001809
Odontogadus merlangus
Foods/Feeding
81-002132
Oncorhynchus
Brood Stock
81-001721
Culture/Propagation
81-001721
Enzymes
81-001940
Escapement
81-002392
Induced Maturation
81-001721
Life History/General
81-002035
Maturation
81-001721
Population Studies
81-002392
Spawning
81-002035
Thymus
81-001941

Oncorhynchus gorbuscha
Culture/Propagation
81-002388
Distribution/Geographical
81-002171
Fry Production
81-002388
Fry Stocking
81-002388
Management/Research--Lakes
81-002420
Stocking/Introductions
81-002388
81-002390
81-002420
Supplemental Stocking
81-002390
Oncorhynchus keta
Cell Division
81-001967
Culture/Propagation
81-002387
Fingerling Production
81-002387
Put-Grow-and-Take
81-002387
Stocking/Introductions
81-002387
Survival
81-002387
Oncorhynchus kisutch
Abundance/Factors of
81-002204
Bacterial Diseases
81-002246
81-002251
Bacterial Kidney Disease
81-002246
Culture Propagation
81-001722
Culture/Propagation
81-001766
Endocrinology
81-001892
Erythromycin Phosphate
81-002246
Escapement
81-002427
Feeding Experiments
81-001766
Feeds
81-001766
Flow Regimes
81-002204
Foods/Feeding
81-002126
Induced Maturation
81-001722
Lipid Content
81-001892
Naphthalene
81-002341

...CONTINUED...
Oncorhynchus kisutch
Oil
81-002341
Oxygen
81-001839
Parasites/Diseases
81-002246
81-002251
Parr-Smolt Transformation
81-001861
Population Studies
81-002404
Sedimentation
81-002300
Starvation
81-001937
Toluene
81-002341
Upwelling
81-002204
Vibrio anguillarum
81-002251
Vibriosis
81-002251
Oncorhynchus nerka
Oxygen
81-001839
Oncorhynchus tshawytscha
Age/Growth
81-002134
Distribution/Geographical
81-002172
Marking/Tagging
81-002385
Population Studies
81-002057
Ophioblennius atlanticus
Territorial Behavior
81-002015
Ophiodon elongatus
Cardio-Vascular System
81-001859
81-001860
Opsanus tau
Metabolic Rates
81-001954
Oxygen
81-001954
Orthodon microlepidotus
Hybridization
81-001980
Oryzias latipes
Early Development
81-001965
Electrophoresis
81-001988
Enzymes
81-001965
Hatching Enzyme
81-001843
Reproductive System
81-001823
Variation Studies
81-001988

Osmerus mordax
Distribution/Geographical
81-002174
Fish Kills
81-002205
Impingement/Entrainment
81-002398
Mortality Factors
81-002205
Parasites/Diseases
81-002239
Power Plants
81-002398
Thermal Shock
81-002398
Paragobiodon xanthosoma
Distribution/Geographical
81-002173
Paraliparis
Reproduction
81-002079
Spawning
81-002079
Parapristipoma trilineatum
Maturation
81-002075
Spawning
81-002075
Peocilia latipinna
Coloration
81-001780
Hormones
81-001780
Peocilia reticulata
Fecundity
81-001741
Nutrition
81-001741
Peprilus simillimus
Spawning
81-002069
Perca flavescens
Distribution/Geographical
81-002197
Foods/Feeding
81-002040
Length-Weight Relationships
81-002040
Life History/General
81-002040
Marking/Tagging
81-002384
Maturation
81-002040
Mortality Rates
81-002040
Reproduction
81-001950
Telemetry
81-002384
Perca fluviatilis
Age/Growth
81-002034

...CONTINUED...

Perca fluviatilis
Bunodera luciopercae
81-002294
Digestion Rates
81-001917
Fecundity
81-002090
Maturation
81-002090
Parasites/Diseases
81-002294
Pulp Mill Effluents
81-002337
Schooling Behavior
81-002009
Spawning
81-002034
81-002090
Trematodes
81-002294
Periophthalmus
Foods/Feeding
81-002143
Terrestrial Grazing
81-002143
Petenia kraussii
Parasites/Diseases
81-002257
Protozoan Diseases
81-002257
Trypanosoma magdalenae
81-002257
Petromyzon marinus
Mouth Parts
81-001797
Phoxinus eos
Distribution/Geographical
81-002197
Phoxinus phoxinus
Orientation/Homing
81-002008
Pimephales promelas
Distribution/Geographical
81-002197
Hydrazine
81-002332
Insecticides
81-002321
Kepone
81-002321
Mirex
81-002321
Organochlorines
81-002321
Phenols
81-002346
Platichthys flesus
Blood Chemistry
81-001938
Enzymes
81-001918
81-001929
81-001938

Platycephalus arenarius
Coloration
81-001784
Platycephalus fuscus
Respiration
81-001853
Plecoglossus altivelis
Bacterial Diseases
81-002240
Dentition
81-001821
Parasites/Diseases
81-002240
Vibrio anguillarum
81-002240
Plectropomus leopardus
Life History/General
81-002032
Pleuronectidae
Spawning
81-002060
Pleuronectiformes
Distribution/Seasonal
81-002107
Plotosus anguillaris
Metabolic Rates
81-001881
Poecilia formosa
Gynogenesis
81-001900
Reproduction
81-001900
Unisex Populations
81-001900
Poecilia mexicana
Gynogenesis
81-001900
Reproduction
81-001900
Unisex Populations
81-001900
Poecilia reticulata
Aggressive Behavior
81-002011
Coloration
81-002011
Life History/General
81-002043
Pollachius virens
Foods/Feeding
81-002114
Polyodon spathula
Abundance/Factors of
81-002200
Management/Research--General
81-002200
Status
81-002200
Pomacentridae
Fish Lists/Keys
81-002162
Taxonomy
81-002162
Pomadasys macracanthus
Age/Growth
81-002151
Pomatoschistus microps
Identification
81-002214
Pomatoschistus minutus
Activity Patterns
81-002002
Circadian Rhythms
81-002002
Identification
81-002214
Pomatoschistus pictus
Identification
81-002214
Protomyctophum arcticum
Distribution/Geographical
81-002189
Pseudolabrus
Distribution/Geographical
81-002224
Pseudolabrus celidotus
Spawning
81-002072
Pseudolabrus torotai
New Species
81-002224
Pseudopleuronectes americanus
Digestive System
81-001903
Early Development
81-001792
Glugea stephani
81-002264
Parasites/Diseases
81-002264
Protozoan Diseases
81-002264
Pseudorasbora parva
Acoustico-Lateralis System
81-001884
Taste Reception
81-001884
Ptychocheilus oregonensis
Foods/Feeding
81-002115
Predator/Prey Relationships
81-002115
Pungitius pungitius
Cestodes
81-002279
Diplostomum spathaceum
81-002279
Parasites/Diseases
81-002275
81-002279
Pituitary Cysts
81-002275
Schistocephalus
81-002279
Reinhardtius hippoglossoides
Variation Studies
81-001972

Rhinichthys cataractae
Activity Patterns
81-002007
Circadian Rhythms
81-002007
Rhinoptera bonasus
Cestodes
81-002296
Echinobothrium bonasum
81-002296
Parasites/Diseases
81-002296
Rhombosolea
Electrophoresis
81-002229
Identification/Larvae
81-002229
Rhytiodus argenteofuscus
Coloration
81-001813
Morphology
81-001813
Taxonomy
81-001813
Rhytiodus microlepis
Coloration
81-001813
Morphology
81-001813
Taxonomy
81-001813
Rivulus cryptocallus
New Species
81-002227
Rutilus rutilus
Auditory Senses
81-002010
Early Development
81-001778
Embryology
81-001778
Hybridization
81-001982
Karyotypes
81-001982
Rutilus rutilus heckeli
Hybridization
81-001978
Salmo clarki
Oil
81-002356
Salmo gairdneri
Acid Mine Water
81-002315
Anethetics
81-002319
Arsenic
81-002328
ATP
81-001916
Bacterial Diseases
81-002248

...CONTINUED...
Salmo gairdneri
Bacterial Kidney Disease
81-002248
Blacktail
81-002297
Blood Chemistry
81-001891
81-001908
81-001936
81-001951
Brood Stock
81-001716
Cadmium
81-002315
81-002326
Cardio-Vascular System
81-001899
Competition
81-002125
81-002135
Copper
81-002315
Copper Sulfate
81-002354
Corticosteroids
81-001925
Culture/Propagation
81-001716
81-001717
81-001718
81-001738
81-001742
81-001748
81-001758
81-001760
81-001761
81-001762
81-001975
81-001985
Currents
81-002014
Cyanide
81-002328
Digestive System
81-001785
81-001848
Diplostomum spathaceum
81-002277
Emzymes
81-001916
Endocrinology
81-001847
Enzymes
81-001834
81-001951
Feeding Experiments
81-001738
81-001742
81-001748
81-001758
81-001760
81-001761
81-001762

...CONTINUED...
Salmo gairdneri
Feeds
81-001742
81-001761
81-001762
Food Conversion Efficiency
81-001738
Foods/Feeding
81-002125
81-002135
Formalin
81-002354
Gamete Storage
81-001717
Heavy Metals
81-002315
81-002355
Hormones
81-001868
81-001901
Hydrocarbons
81-002324
Induced Maturation
81-001718
IPN
81-002266
81-002271
Lead
81-002355
Life History/General
81-002035
Lipid Metabolism
81-001748
81-001846
Liver
81-001783
Mercury
81-002338
Mortality Rates
81-002054
MS-222
81-002319
Nitrite
81-002348
Nutrition
81-001760
81-001763
81-001936
Osmoregulation
81-001877
81-001901
Parasites/Diseases
81-002248
81-002266
81-002271
81-002277
81-002297
Phenoxyethanol
81-002319
Population Studies
81-002047
81-002054
Quinaldine
81-002319

...CONTINUED...
Salmo gairdneri
Rheotropism
81-002013
81-002014
Salinity
81-001877
Selective Breeding
81-001975
Solvent Extraction
81-002326
Spawning
81-002035
81-002047
Starvation
81-001835
81-001891
Temperature
81-001899
81-001916
Trematodes
81-002277
Triploid Fish
81-001985
Viral Diseases
81-002266
81-002271
Vitamins
81-001966
Vitellogenin
81-001956
Zinc
81-002315
Salmo salar
Abundance/Factors of
81-002207
Age/Growth
81-002156
Bacterial Diseases
81-002243
81-002270
Blacktail
81-002297
Culture/Propagation
81-001720
81-001747
Digestive System
81-001905
Feeds
81-001747
Flexibacter columnaris
81-002270
Fluoride
81-001747
Foods/Feeding/Selectivity
81-002146
Hitra Disease
81-002243
Hybridization
81-001968
Management/Research--General
81-002366
Maturation
81-002071

...CONTINUED...
Salmo salar
Movements
81-002105
Net-Pen Culture
81-001720
Parasites/Diseases
81-002243
81-002270
81-002297
Predator/Prey Relationships
81-002146
Saddleback Disease
81-002270
Starvation
81-001905
Variation Studies
81-001986
81-002105
Vibriosis
81-002243
Salmo salar x S. trutta
Hybridization
81-001968
Salmo trutta
Acid Mine Water
81-002315
Age/Growth
81-002158
Bacterial Diseases
81-002248
Bacterial Kidney Disease
81-002248
Blacktail
81-002297
Cadmium
81-002315
Competition
81-002125
Copper
81-002315
Electrophoresis
81-001973
81-001990
Foods/Feeding
81-002112
81-002125
81-002128
Heavy Metals
81-002315
Home Range
81-002100
Hybridization
81-001968
Movements
81-002100
Parasites/Diseases
81-002248
81-002297
Swimming Performance
81-002017
Variation Studies
81-001990
Zinc
81-002315
Salmo trutta fario
Morphology
81-001822
Salmonidae
Age/Growth
81-002124
Bibliographies
81-002089
Culture/Propagation
81-002124
Management/Research--Lakes
81-002421
Microsporidium rhabdophilia
81-002262
Movements
81-002386
Parasites/Diseases
81-002262
81-002276
Predator/Prey Relationships
81-002115
Protozoan Diseases
81-002262
Put-and-Take
81-002386
Regulations
81-002381
Size Limits
81-002381
Spawning
81-002089
Stocking/Introductions
81-002386
Sunburn
81-002276
Salmoniformes
Morphology
81-002230
Taxonomy
81-002230
Salvelinus
Life History/General
81-002226
Taxonomy
81-002226
Salvelinus alpinus
Bibliographies
81-002039
Life History/General
81-002039
Salvelinus fontinalis
Bacterial Disease
81-002248
Bacterial Kidney Disease
81-002248
Competition
81-002125
Foods/Feeding
81-002125
Parasites/Diseases
81-002248
Salvelinus fontinalis x S. namaycush
Spawning
81-002063

Salvelinus namaycush
Chlorinated Hydrocarbons
81-002351
Spawning
81-002073
Sarotherodon galilaeus
Fecundity
81-002065
Spawning
81-002065
Scapanorhynchus owstoni
Distribution/Geographical
81-002190
Scardinius erythrophthalmus
Early Development
81-001778
Embryology
81-001778
Schizodon fasciatus
Coloration
81-001813
Morphology
81-001813
Taxonomy
81-001813
Scomber scombrus
Distribution/Geographical
81-002097
Distribution/Seasonal
81-002097
Scombridae
Culture/Propagation
81-001734
Distribution/Seasonal
81-002096
Management/Research--Marine
81-002436
Population Studies
81-002436
Scophthalmus maeoticus
Hypothalamic-Hypophyseal System
81-001825
Scophthalmus maximus
Culture/Propagation
81-001756
Feeding Experiments
81-001756
Fingerling Production
81-001756
Sebastes diploproa
Light
81-002093
Movements
81-002093
Temperature
81-002093
Semotilus margarita
Distribution/Geographical
81-002197
Seriola quinqueradiata
Bacterial Diseases
81-002244

...CONTINUED...
Seriola quinqueradiata
Enzymes
81-001933
Heteraxine heterocerca
81-002293
Immunization
81-002244
Lipid Metabolism
81-001933
Parasites/Diseases
81-002244
81-002293
Pseudotuberculosis
81-002244
Toxic Algae
81-002357
Trematodes
81-002293
Sparus aurata
Bacterial Diseases
81-002242
Nutrition
81-001754
Parasites/Diseases
81-002242
Pyridoxine
81-001754
Squaliformes
Attacks on Humans
81-001996
Predator/Prey Relationships
81-002110
Stenodus leucichthys
Reproduction
81-001890
Stizostedion lucioperca
Harvest
81-002055
Mortality Rates
81-002055
Population Studies
81-002055
Stizostedion vitreum vitreum
Abundance
81-002029
Abundance/Factors of
81-002206
Age/Growth
81-002029
Foods/Feeding
81-002029
Management/Research--Lakes
81-002424
Marking/Tagging
81-002383
Population Studies
81-002424
Size Limits
81-002382
Synanceia trachynis
Toxins
81-002322
Syngnathus fuscus
Embryology
81-001869

...CONTINUED...
Syngnathus fuscus
Reproduction
81-001869
Theragra chalcogramma
Age/Growth
81-002150
Early Development
81-001798
Thorogobius ephippiatus
Distribution/Geographical
81-002179
Thunnus alalunga
Age/Growth
81-002150
Distribution/Factors of
81-002193
Distribution/Geographical
81-002193
Thunnus albacares
Age/Growth
81-002161
Heavy Metals
81-002345
Mercury
81-002345
Thymallus arcticus
Management/Research--General
81-002363
Tilapia
Culture/Propagation
81-002396
Endosulfan
81-002339
Fertilization/Soil and Water
81-002396
Insecticides
81-002339
Pond Culture
81-002396
Tilapia aurea
Aromatic Hydrocarbons
81-002350
Culture/Propagation
81-001932
Sex Reversal
81-001932
TSO
81-002350
Tilapia grahami
Osmoregulation
81-001857
Tilapia mossambica
Coloration
81-001957
Dichlorvos
81-002347
Digestive System
81-001837
Endocrinology
81-001907
Osmoregulation
81-001907
Tilapia nilotica
Culture/Propagation
81-001724

...CONTINUED...
Culture/Propagation
81-001745
81-001746
Feeding Experiments
81-001746
Feeds
81-001745
Sewage Effluents
81-001724
81-001746
Tilapia rendalli
Brooding Behavior
81-002085
Spawning
81-002085
Tinca tinca
Embryology
81-001805
Thermal Shock
81-001849
Tor tor
Culture/Propagation
81-001789
Early Development
81-001789
Eggs
81-001789
Trachurus symmetricus murphyi
Life History/General
81-002026
Trematomus bernacchii
Fecundity
81-002062
Reproduction
81-002062
Trichodon trichodon
Spawning
81-002081
Trimmatom
New Genus
81-002233
Trimmatom namus
New Species
81-002233
Trimmatom offucius
New Species
81-002233
Trisopterus esmarkii
Distribution/Geographical
81-002164
Urophycis chuss
Foods/Feeding
81-002114
Urophycis regius
Foods/Feeding
81-002114
Urophycis tenuis
Foods/Feeding
81-002114
Vimba vimba
Meristic Studies
81-001794
Xiphiidae
Management/Research--Marine
81-002436

...CONTINUED...
Xiphiidae
  Population Studies
   81-002436
Xyrichtys incandescens
  New Species
   81-002169
Zoarces viviparus
  Lipid Content
   81-001914

☆ U.S. GOVERNMENT PRINTING OFFICE: 1981—777-060/6

SUBSCRIPTION INFORMATION

Remit $8.50 ($10.65 Canada and foreign) for one year's subscription to:

The Government Printing Office
Superintendent of Documents
Washington, DC 20402

"Subscription to *Sport Fishery Abstracts*" should be clearly written on the check.

U.S. Federal Agencies in wildlife-related fields and individuals or agencies who exchange domestic or foreign publications may receive free subscription to *Sport Fishery Abstracts* by writing to:

Editorial Office—*Sport Fishery Abstracts*
U.S. Fish and Wildlife Service
270 Aylesworth Hall, CSU
Fort Collins, CO 80523

CHANGE OF ADDRESS

If SFA is the first entry on the first line of your address label, send your new address and your former address *exactly* as it appears on your mailing label to:

The Government Printing Office
Superintendent of Documents
Washington, DC 20402

If SFA or SFX appears at the right margin of your address label, send your new address and your former address *exactly* as it appears on your mailing label to:

Editorial Office—*Sport Fishery Abstracts*
U.S. Fish and Wildlife Service
270 Aylesworth Hall, CSU
Fort Collins, CO 80523

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
EDITORIAL OFFICE
AYLESWORTH HALL, CSU
FORT COLLINS, COLORADO 80523

THIRD-CLASS MAIL

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF THE INTERIOR

PERMIT No. G-77